ECHANICS · AUTOS · HOME IMPROVEMENTS

POPULAR SCIENCE

March 35c

MONTHLY

UNIVERSITY OF MICHIGAN
FEB 28 1956
PERIODICAL READING ROOM

w to Build This
tboard Hot Rod
E 112

Spring Boat Fair

ECIAL TURES

PAGES 69 TO 122

You'll Soon Ride 2-Headed Trains

PAGE 123

New Spark Plug Invention!

Nickel-Cadmium

THE INSULATOR ...High-voltage patented Ebanite® insulator, developed and used only by Life-Long, has a hardness in the same range as precious jewels. You can identify Life-Long Plugs by the black insulators. This costly new material has 20 times higher thermal conductivity than ordinary insulators.

THE BUSINESS END ...New type solid electrodes have no points to burn off! The "business" end of Life-Long Plug utilizes unique nickel-cadmium electrodes to produce fuller, hotter spark arcing from 21 or more points and spreading around the full 360° circle. Life-Long Plugs have approximately 40 times more firing surface than conventional one-electrode plugs, giving more efficient, even combustion.

THE SHELL ...Made of a new alloy developed specifically for Life-Long by modern metallurgy. Unlike old style 2-piece shells, the Life-Long shell is one precision-machined piece fused to the Ebanite insulator under tremendous hydraulic pressure and induction to make a positive seal. This prevents "blow-by," major cause of failure in plugs with 2-part shells.

Bonded Guarantee

"I certify that the set of self-cleaning, 21 pt. Life-Long Nickel-Cadmium Spark Plugs you will receive are identical to those used in my own car for over 100,000 miles. I guarantee that Life-Long Plugs will give you an immediate horsepower and mileage gain and will continue to fire clean, hot and steady without cleaning or regapping."

J. M. Watt

J. M. WATT, President
LIFE-LONG SPARK PLUG CORP.

Only spark plug guarantee backed by a cash bond held by an independent financial institution (details on request).

LIFE-LONG NICKEL-CADMIUM PLUGS ARE GUARANTEED TO:

1—End plug replacement costs
2—Step up engine horsepower
3—Increase your gasoline mileage
4—Improve acceleration
5—Give smoother idling
6—End engine knock
7—Never need regapping

With the introduction of sensational new-type Life-Long Nickel-Cadmium Plugs, the spark plug is no longer the "most troublesome, most often-replaced" part of your automobile. In fact, you will never have to replace the plugs in your car once you install a set of Life-Long Plugs!

LIFE-LONG—WORLD'S ONLY PLUG WITH FULL-CIRCLE FIRING

Life-Long's revolutionary "ring of fire" principle is the first major improvement in plugs in 25 years. Instead of small "spot" spark arcing between the same two points, the Life-Long Plug makes a hot spark 400% to 500% greater in volume, spread around the entire circumference of the solid electrode. The piston stroke of today's high-compression engines is so powerful that it can actually "blow out" the spark produced by old type plugs. Blowing out is impossible with Life-Long's full-circle spark.

Heat is spread around the full perimeter, resulting in cooler electrode temperature. The causes of wear, burning and insulator failure are eliminated.

SELF-CLEANING. Because the Life-Long Plug fires simultaneously inside and outside the shell, fuel mixture is ignited at the same time a powerful turbo wiping action, created by the piston stroke, burns and blows out the carbon. Power loss is prevented and you get greatly increased horsepower and gasoline mileage. In a series of road tests, some cars have shown 10 horsepower gain, mileage increase 15% and more.

OIL INDUSTRY RESEARCH DISCOVERS AMAZING ELECTRODE SECRET

Research engineers of leading oil companies recently revealed that nickel-cadmium is the most perfect material yet developed for the electrodes of spark plugs designed for modern high-compression, internal combustion automobile engines. The nickel-cadmium solid electrode of the Life-Long Plug has ideal characteristics of extremely high conductivity and durability, being able to withstand temperatures of 3500° indefinitely.

BUILT-IN CADALLOY CATALYST

These same research engineers also discovered that a new alloy (which we call Cadalloy) introduced into the combustion chamber of a plug, acts as a catalyst to produce the most efficient fuel combustion. Life-Long Plugs are the first to use this important discovery!

ATTENTION, OWNERS OF 12-VOLT AUTOS. Conventional plugs, designed for 6-volt electrical systems, do not function well in modern 12-volt systems. Life-Long Plugs are designed to handle twice the voltage capacity of 6-volt systems. If your car has a 12-volt system, don't be misled—only Life-Long gives you full plug efficiency!

LIFE-LONG PLUGS ACTUALLY COST LESS! A set of Life-Long Nickel-Cadmium Plugs will outlast six or more sets of ordinary plugs. You end replacement costs completely. Yet the set of 6 Life-Long Plugs costs only $8.95 each. Set of 8 only $11.95.

ORDER REGISTERED SET FOR YOUR CAR NOW. Life-Long Nickel-Cadmium Spark Plugs come to you in a tamper-proof, laminated plastic container. Sealed at the factory, your Life-Long Plugs are not touched until you break the seal.

PLEASE NOTE: *The Life-Long spark plug is different in every way—not just an "improved" plug, but an entirely new engineering development!*

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Name _____

Street _____

City _____ Zone ____ State _____

Year of Car _____ Model of Car _____

Make of Car _____ No. of Cylinders _____

I enclose ☐ check ☐ cash ☐ money order

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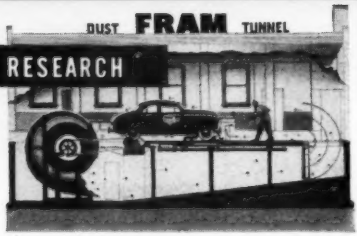

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Only FRAM has developed oil, air, fuel and water filters for *complete engine protection*. Whatever the make or model of your engine, FRAM Filters will safeguard its life against airborne abrasives, crankcase contaminants, sludge, dust, dirt and rust at every vital point.

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Vol. 168: No. 3

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Mechanics and Handicraft
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America's Leading New-Idea Magazine for 84 Years

MARCH, 1956

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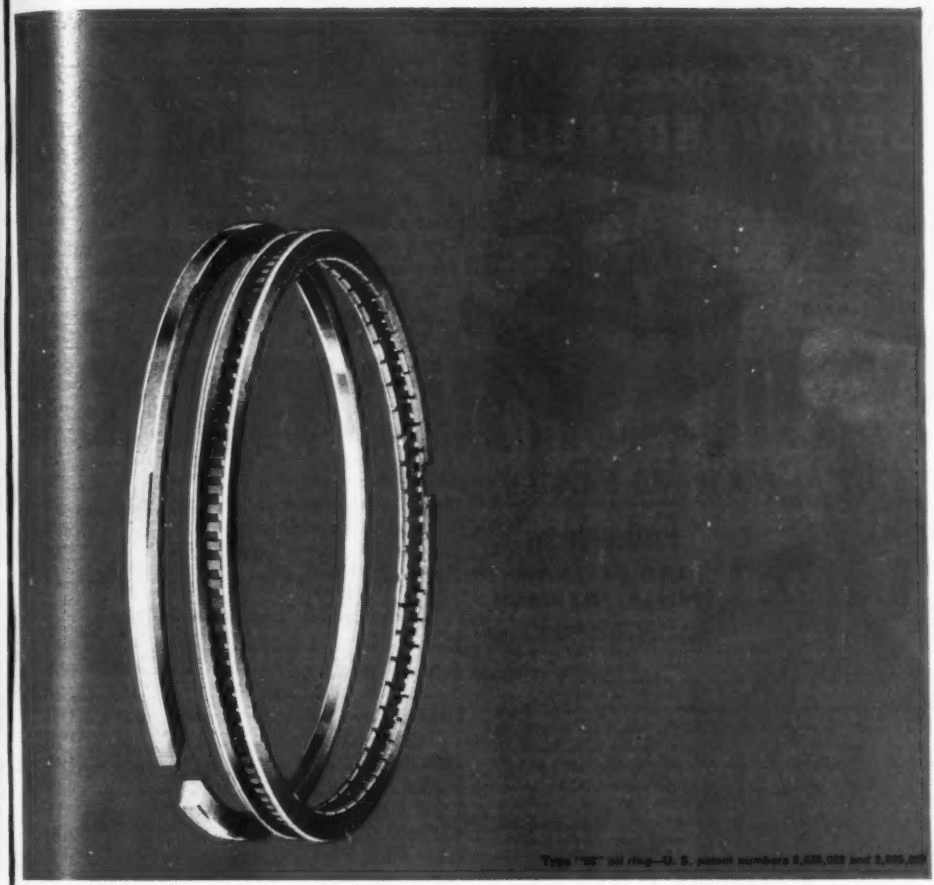

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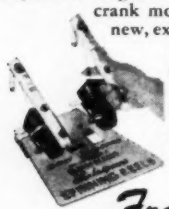

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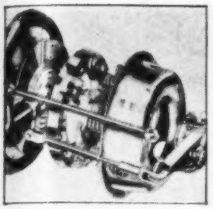

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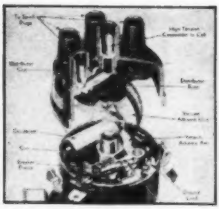
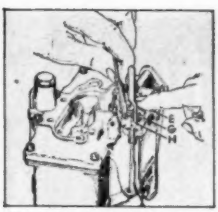
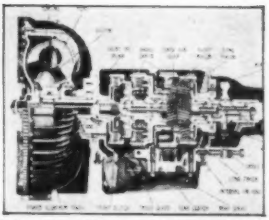


Diagrams, tables and text take the "mystery" out of all ignition systems.



You get illustrated repair procedures for all types of carburetors.

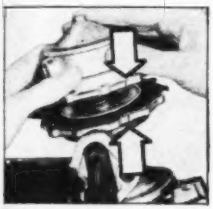


ALL AUTOMATIC TRANSMISSIONS are fully covered in special big section. (NOTE: All pictures shown here are greatly reduced in size. Actually, this giant book is almost a *foot high!*)

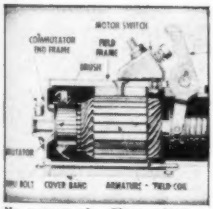
Here's the EASY Step-by-Step Way to

FIX ANY CAR IN A JIFFY!

Now—Whether You're a Beginner or Expert Mechanic—You Can "Lick" Any Repair Job On Any Car Built From 1940 Thru 1955



Fuel pumps can cause trouble. Pictures show exactly how to take them apart, fix them.



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Letters

PSM Keeps Home Fire Burning

Your highly practical and useful article, "How to Service Your Oil Burner" [Aug., p. 146], was a lifesaver to yours truly last night. At three a. m., with the outside temperature doing a nosedive, the old heating

plant gave up the ghost with a dismal groan. Thanks to your clear illustrations and concise directions I was able to locate the trouble and remove same quite easily.

STANFORD BOB GILLEY, Terre Haute, Ind.

Ball Bearings Are Not Bearing Balls

Being an ordinary machinist, I wondered what kind of "ball bearings" Ross Taylor uses in his trick air gun ["He's Hollywood's Kindest Killer," Dec., p. 128]. A ball bearing has a race or two, a cone and maybe a separator to space the balls. How does he get all that stuff into an air-gun barrel?

This is all in fun, but why not use the correct term? You had it right in the story on the child's race car on page 209 of the same issue.

WALDEMAR G. HANSEN, Los Angeles

The one PSM editor who did not know a bearing ball from a ball bearing knows it now.

A Satellite Suggestion

Your model of the proposed artificial satellite (Jan. '56, p. 124) is very interesting. But why make separate units of the third-stage rocket and the satellite? Since they are both going to the same place, and weight is so important, it would seem to be more efficient just to put the satellite's instruments

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inside the third-stage rocket and let it go on orbiting around the earth.

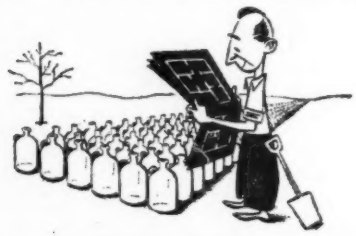
ROBERT HARE, Barberton, Ohio

Your suggestion is logical but probably not practical. When it is designed, the third-stage rocket will be a standard production item. Each satellite will be tailor-made for its particular job by scientists in electronic laboratories. Also, the rocket, a comparatively large empty shell after burn-out, would not be an efficient orbiter.

Has Jugs, Wants House

The unusual materials used to build houses —such as Mr. Emerson's Styrofoam-plastic home [Dec., p. 81]—interest me very much. I have on hand about 2,000 gallon glass jugs and I would like to use them to build a house. Is there any particular method or special cement to enable me to do this?

WENDALL C. BRIGGS, Virginia, Ill.



Your problem is one on which, oddly, there seems to be no technical literature.

Do Bugs Eat Plastic?

You say that the Styrofoam Mr. Emerson built his house of is distasteful to bugs. It sure isn't distasteful to our Florida cockroaches. They eat it like a kid eats candy, making a crunching noise like a cow in a patch of celery. They ate all the Styrofoam out of a pair of canoe outriggers that I was experimenting with.

EVERETT REID, McIntosh, Fla.

The manufacturer of Styrofoam, Dow Chemical Co., insists, "Styrofoam contains nothing of food value and consequently does not attract rodents or vermin."

Praise for Good Furniture

May I compliment POPULAR SCIENCE for the excellent articles covering the construction of the chairs, table and buffet [Nov.,

New greaseless way to keep your hair neat all day

Prevents dry, unruly "North-woods hair"

New Vitalis keeps hair in place and prevents dryness with V-7, the *greaseless* grooming discovery.

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INVENTORS

Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

A patent gives the inventor the exclusive right to prevent others from making, using, or selling the invention claimed in the patent for a period of seventeen years.

The Patent Laws were enacted for the benefit of the inventor to give him protection for the features of his invention which are patentable. These features must be properly and concisely set forth and claimed in a formal application for patent, in order to comply with the requirements of the Patent Laws. For that reason, unless the inventor is familiar with patent matters, he should engage a competent registered patent attorney or agent to represent him. We are registered to practice before the U. S. Patent Office and are prepared to serve you in the handling of your patent matters.

A specially prepared booklet entitled "Patent Guide for the Inventor", containing detailed information with respect to patent protection and procedure, together with a "Record of Invention" form will be promptly forwarded to you without obligation upon request.

CLARENCE A. O'BRIEN & HARVEY JACOBSON

Registered Patent Attorneys

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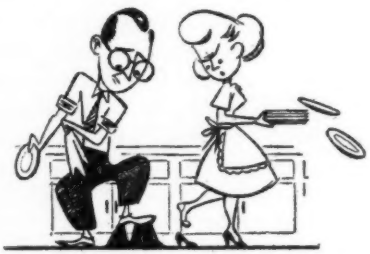
p. 178; Dec., p. 184; Jan., p. 181] designed for PSM by Martin Stan Buchner. There are so many books and articles written on the outdated traditional styles and so few on the contemporary styles. It is refreshing to see an article featuring such good design and simple construction.

JON A. BRADLEY, San Diego

Too Much Adhesive Is Sticky Problem

My husband laid our kitchen vinyl tile a year ago. To this day the black paste is



still oozing up in places where we walk the most. Shouldn't it be dry by now?

MRS. L. M. WINT, Detroit

Apparently your husband was too generous with adhesive. Some types are formulated to stay sticky forever: They never dry. Short of ripping up your floor and starting all over again, you can try to squeeze out the excess cement by going over the tiles with a roller. Wipe up what comes through the joints with a rag soaked in solvent.

Says Automatic Brake Is Old Stuff

Regarding your article, "Out Goes the Brake Pedal" [Sept., p. 121], I've actually driven a car with brains. Its inventor has driven it for the past 14 years.

The single-pedal, semi-automatic control of motor and brake power was designed by Mr. Harley C. Mack in March, 1941! A 1941 Fluid Drive Chrysler, equipped with a Mack control, was driven 200,000 miles before it was junked. The brakes were relined after the first 100,000. A second Chrysler now records better than 100,000 miles without a single replacement or adjustment. The original brake lining and drums are still intact. Gas consumption is lower, tire mileage up.

The brain of Mr. Mack's invention is a power-control valve. It is constructed with heel and toe sections, and has a neutral position. Braking is by the simple backward ankle movement of the heel section of the

INVENTORS

If you believe that you have an invention, you should find out how to protect it. The first step is to have a search made of the prior pertinent U. S. patents. If a report on this search indicates that the invention appears patentable you can apply for a patent, and the specifications and claims should be prepared.

The firm of McMorrow, Berman & Davidson, with offices in Washington, D. C., is qualified to take the necessary steps for you. We can make a preliminary search on your invention, advise you whether we think it can be patented, and prepare your application for patent.

Unless you are fully familiar with the U. S. Patent Laws, we recommend that you engage the services of a Registered Patent Attorney to protect your interests. The patent laws are *your* laws. A patent gives you the right to prevent others from making, using or selling the invention claimed in your patent for a period of 17 years.

Use these patent laws for your protection. Investigate whether your invention can be patented. If you have what you believe to be an invention, we suggest that you have this firm make a search for you.

Send for a copy of our Patent Booklet entitled "How To Protect Your Invention," containing information about patent protection and patent procedure. Along with this we will also send you an "Invention Record" form, for your use in writing down and sketching details of your invention. We will mail them promptly. No obligation. They are yours for the asking.

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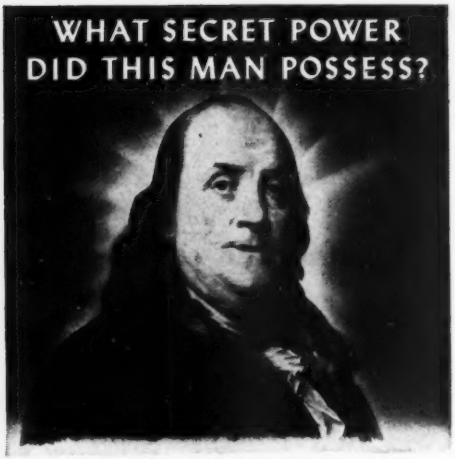

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(A Rosicrucian)

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pedal. Should the operator remove his foot from the control pedal, the brake will apply and stop the vehicle. Mr. Mack is president of Mack Engineering Co., Inc., manufacturers of the Universal Power Brake.

SAM H. RINKER, Joplin, Mo.

Good Braking Is Serious Business

J. Bevin's letter [Nov., p. 14] ridiculing the automatic brake was very funny—maybe. To some people everything is a big joke.

But let us see just how funny this Hemphill automatic brake is. According to the National Safety Council, it takes a car going 50 m.p.h. 220 feet to come to a panic stop. The Hemphill automatic brake panic-stops a car in 128 feet—92 feet shorter. That's serious business and nothing to laugh about.

Z. T. BOGAR, Burtonsville, Md.

PSM Goes to College

In one of my classes at the Collegiate, students make short speeches as part of their term work in composition. I was glad that, when my turn came around, I was able to give a speech on the history of the Lincoln Continental. I don't think this subject would have been possible for me to speak on if it had not been for two articles on the Continental in your July and November issues.

ROSS LOWREY, Toronto, Ont.

Uranium-Sample Price Corrected

There appears to be an error in your mention of the price of the samples of uranium ore that are used to calibrate Geiger counters [Jan., p. 209]. Our samples are $2.50 *apiece*, and our calibration set of four samples is $10.00.

C. J. RODDEN, Area Manager
U. S. Atomic Energy Commission
New Brunswick, N. J.

Cabbie Shifts Gears with Window Crank

You're right about cab drivers liking the new small taxis [Jan., p. 138]. The only objection that I have heard came from a hackie in a '56 Dodge. He said that the window crank was so near the automatic-shift push buttons that every time he works the crank he changes gears.

EDWARD C. CASS, Lexington, Mass.

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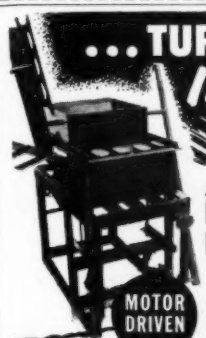

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MICRO-FLUFF IS BEAUTIFUL—LONG-WEARING. the most amazing material you ever saw. It comes in every rainbow color, has the **TOUCH** appeal of luxurious velvet or suede, **and** goes on practically **any** surface—paper, metal, wood, glass, plastic, plaster, rubber, etc. Wonderful to line silverware or hosiery drawers, cover and line jewelry boxes, decorate lamps and lamp shades, finish the inside of auto trunks or glove compartments (to protect luggage and accessories from scratching) re-cover women's party shoes, phonograph turntables, etc. Apply to toys, figurines, wall plaques, signs, store displays—a thousand-and-one other items, new or old. **MICRO-FLUFF** makes old objects beautiful and salable—increases value of many **new** products by 500%.

Big-profit orders come from neighbors, gift shops, stores of all kinds. Every household has one or more items that can be saved from discard by a **FLOK-KRAFT** job. Decorate store display cases and windows (jewelers love this) also supply them with fast-selling **FLOK-KRAFTED** gift items and other merchandise. Manufacturers are prospects for contracts to apply **FLOK-KRAFT** to furniture, instrument cases, luggage, and hundreds of other products. Every neighborhood needs a **FLOK-KRAFTER. HELP US FILL HUGE DEMAND.**

Since succeeding beyond my wildest dreams in my own **FLOK-KRAFT** business, I have concentrated on helping ambitious men get started the same way toward a successful future, free of time clocks and nagging bosses. My plan is designed to help you start at home in spare time, and build gradually toward a full-time business with employees working for you. And you can start **RIGHT NOW.** Just send me your name and address on a postcard, and I'll rush you a **FREE SAMPLE OF FLOK-KRAFT MICRO-FLUFF** and full **FREE** details. I'll also arrange to send you the **complete FLOK-KRAFT MICRO-FLUFF** outfit to try out right in your own home without risk. The outfit includes detailed instructions with hundreds of show-how photographs and drawings that make everything simple, right from the start. Also included is our specially designed, high-velocity Applicator and a generous supply of **FLOK-KRAFT MICRO-FLUFF**—everything you need to get going right away. You owe it to yourself to investigate. Rush me your name and address today by Airmail, and I'll show you how to start making money at once!

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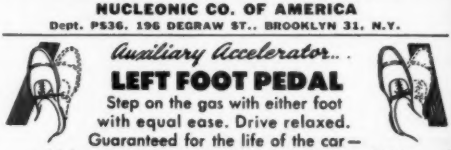

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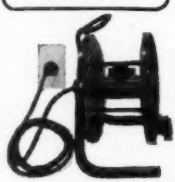

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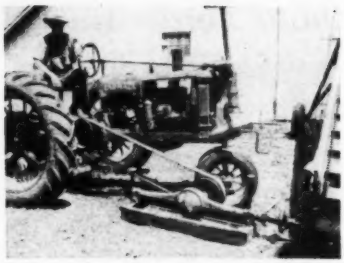
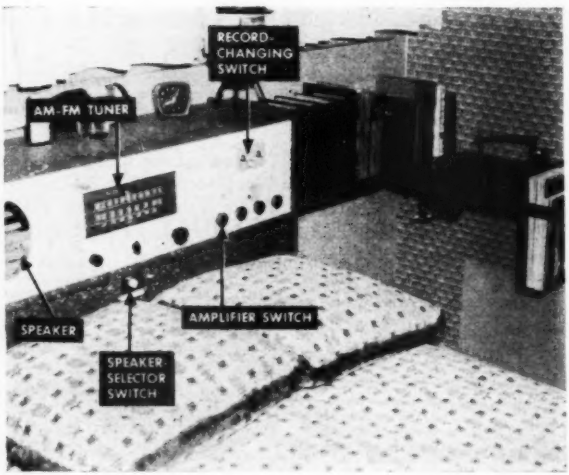


Auto Axle Right-Angles Power. To run a farm elevator where his tractor cannot be parallel to it, Kenneth Ornduff of Ainsworth, Iowa, runs the take-off belt to the shortened drive shaft of an auto rear-end assembly. Both axle ends are squared, so that power can be taken off either through a slip clutch, the other being locked to produce torque.

Bike Gets Two Front Wheels. Neighbors of C. A. Cole in Graham, Ala., learn to ride without spills on his special three-wheeler. He bent the stems of two old bike forks to right angles, bolted them to one another and then to the main stem of the bike. Spaced 20" apart, the two front wheels are said to steer just about as easily as one.

Bedside Hi-Fi Control. With a headboard wired for sound, Donald Goldfarb of Beverly Hills, Calif., operates an elaborate hi-fi setup in his room without hopping off the bed. He flips one switch to connect an AM-FM tuner or an automatic record player to the amplifier. Another switch changes or rejects records. And sound can be switched to one or all of three speakers. For full-blast hi-fi there are 8" and 15" speakers. An 8" headboard unit provides quieter listening.



"Pro" Glue Gives Hobbyists "Pro" Results!

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YOU can machine Jobs 20 minutes after Gluing!

You save a lot of time when you can machine a job just 20 minutes after gluing! Hobbyists who use Weldwood Presto-Set* Glue often do just that! Presto-Set Glue is ready-to-use! Sets fast! Bonds like magic! It's the first white glue worthy of the Weldwood name. Bonds wood to wood, wood to cloth, cloth to paper, upholstery fabrics to wood, and many, many other combinations! Let this Wizard with Wood speed things up around your workshop!

Keep a Presto-Set Glue Squeezer at your bench!

It's a real shop tool. Runs glue into grooves, dowel holes, hard-to-reach corners—quicker, cleaner. No waste. Get one today!

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Painters' Secret Revealed!

Many hobbyists have been wondering how professional painters get those beautiful natural wood finishes. The magic word is Satinlac! Satinlac gives a handsome, satiny effect which wears well and is easy to maintain. Dries so quickly it's ready for the next coat in just 3 or 4 hours. In a jiffy you have a "custom-finished" job!

Clear Firzite tames Wild Wood Grain!

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Blond Finish on Furniture? Use White Firzite!

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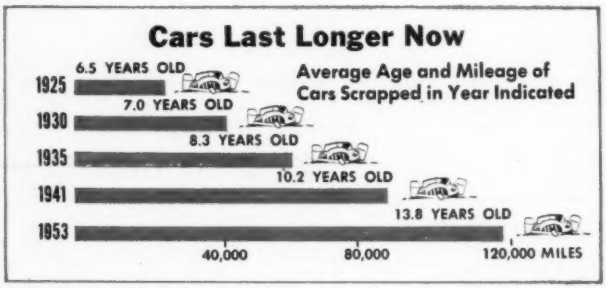
POPULAR SCIENCE MONTHLY

LATE NEWS...

Auto paints that need no waxing are being used on a few '56 cars. Du Pont contends that its two new finishes, Lucite and Dulux 100, hold color and gloss so well that simple washing will restore a new car's luster, at least during the first 18 months. Future Lucite lacquer may contain metallic pigments that will make a car's color appear to change as it goes by.

A new system of marking lumber grades is now being used by West Coast lumbermen. The old No. 1 has become Construction, No. 2 is Standard, No. 3 is Utility and No. 4 is Economy. The grades themselves have not been changed much, just the names. The switch-over was made to help do-it-yourselfers get what they need (neophytes often insisted on costly No. 1 when No. 3 was good enough). Grade marks for finish lumber stay as they were.



A four-cycle outboard—a hefty four-cylinder job that turns out 35 hp.—eliminates the chore of mixing gas and oil, which two-cycle engines require. An electric starter is standard on the new Fageol 44. (For more news of boats and engines, see p. 99.)

Orphan viruses have been found by scientists studying polio. The orphans are like other disease-causing viruses, but they cannot be linked with any known disease.

The Perhapsatron, first machine that Los Alamos scientists built to study fusion power, may show how to tame the H-bomb. It was designed for research on the Pinch Effect: the magnetically caused contraction of a current-carrying stream of gas. This reduces the stream to a narrow thread that does not touch the container walls. The Pinch Effect might permit the gas stream to be heated to the tremendous fusion temperatures without melting the container.

Atomic airplanes came a big step closer to reality with the first flight of a nuclear reactor, in a B-36 bomber. The reactor operated in the air, but it did not power the plane.

Research on MS—the fatal muscular dystrophy—achieved a major breakthrough with the discovery of MS-afflicted mice by Ann Michelson, a Smith College undergraduate working at Jackson Laboratory. These staggering mice are the first animals found for testing MS treatments.

Air turbines will power all accessories on the B-52. Air from the jet engines will spin turbines driving hydraulic pumps or electric generators. The turbines, made by General Electric, can be installed anywhere on the plane.

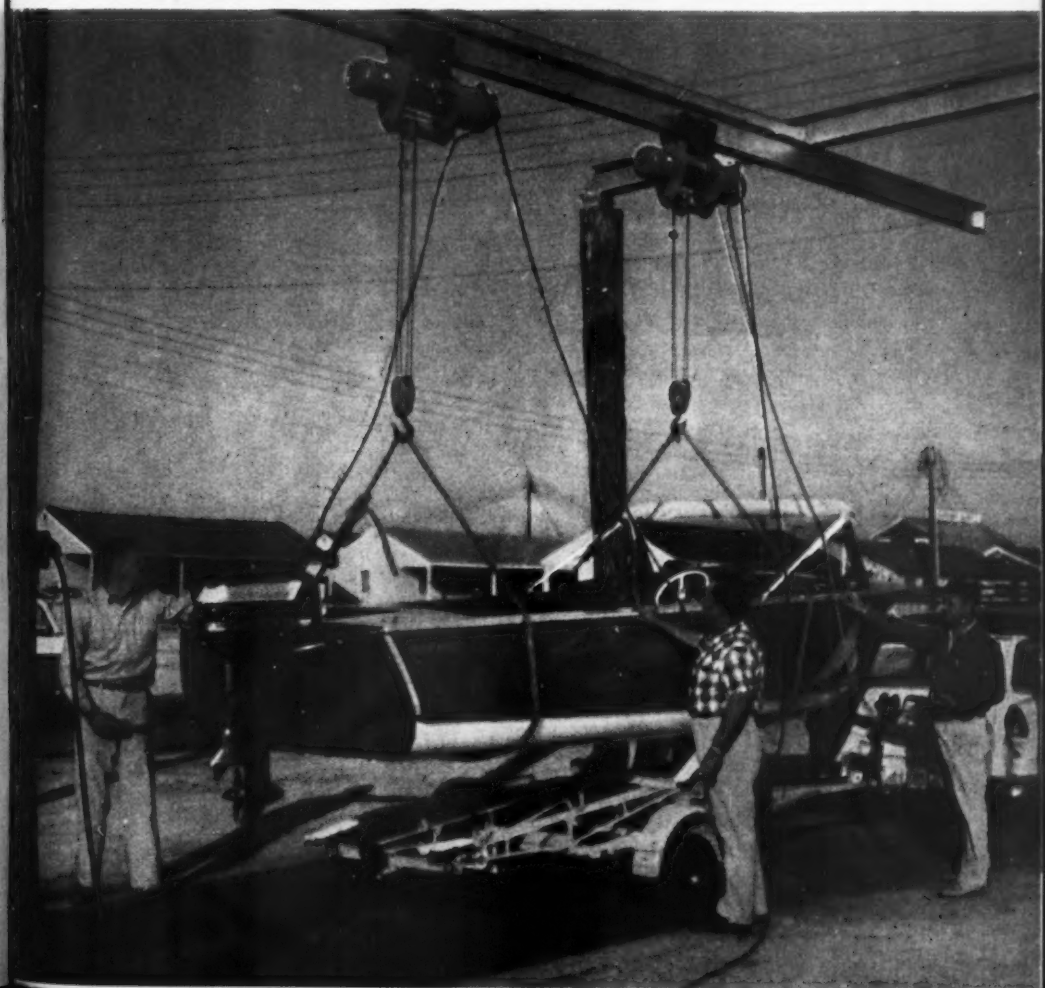
Seven of anything is the maximum load the brain can handle easily, Prof. George A. Miller of Harvard has found. Men have difficulty remembering more than seven items, or judging more than seven degrees of magnitude.

Good book. The conquest of the doorway to space is detailed in *200 Miles Up* (Ronald Press, $5) by J. Gordon Vaeth of the Navy. It covers, in simple text and good pictures, upper-air exploration from its beginnings in 1946 to the plans for artificial satellites.

POPULAR SCIENCE
REG. U.S. PAT. OFF. Monthly

Spring boat fair

Suddenly, everybody's going outboarding—or dreaming of it. This year about five million outboard motors will propel more than 25 million Americans over fresh or salt water on some kind of boating sport. A key to the outboard's skyrocketing popularity is its versatility: You can race at alarming velocity on a bouncy little shingle, or put-put in wily pursuit of the small-mouthed bass; you can take the family on a hot-dog picnic, or make a week's trip on a comfortable cruiser. On the next 23 pages you will find a series of special articles on how to get the most fun out of this kind of boating.



Matching the motor to your boat

SELECTING the right motor for an outboard hull is a problem that is fumbled surprisingly often—as inspection of many a public mooring will show. The typical difficulty isn't with underpowering, which is obvious, as much as with overpowering, which isn't.

Clamping too big a motor on the transom is not only dangerous at times but it's also a little dumb: The motor costs more to buy and more to feed, and it *never* pays off in proportional speed increase. The captions and diagrams at the right list the hull-and-motor combinations that are recommended by experienced boatmen, and by the makers of both motors and hulls.

SMALL ROWBOAT, the fisherman's favorite, is a 12- or 14-foot displacement boat.

Horsepower	*Speed*	*Miles per gal.*
1.7	6	30
3	7	15
5	8	12
7½	8	8

DINGHY OR PRAM is usually eight to 10 feet long. (A dinghy typically has a pointed bow, a pram a square-ended one.) These are displacement hulls, with round or V bottoms. Small motors are desirable.

Horsepower	*Speed*	*Miles per gal.*
1.7	4	25
3	6	12

Boats belong to two main families

DISPLACEMENT HULL has a curved bottom. Broad amidships, it narrows at stern.

PLANING HULL has a straight bottom that always becomes broad and flat at the stern.

Which hull? The first step is to determine which of the two basic hull types you have—displacement or planing. While a few hulls fall into a kind of no man's land between, most are easy to identify as one or the other.

A displacement hull is shaped to go *through* the water, and it is typically broadest near the middle, narrowing at

LARGE ROWBOAT may be 15 to 18 feet long, may have a flat, round, or V-bottom displacement hull. Though big and heavy, it does not want to be overpowered.

Horsepower	*Speed*	*Miles per gal.*
3	6	13
5	7	12
7½	9	10

SQUARE-ENDED CANOE with aluminum or fabric skin is primarily a displacement boat, although it can be planed with high power.

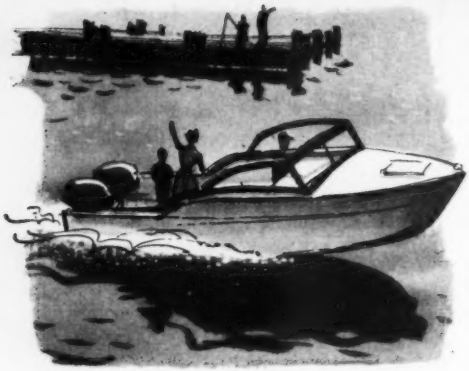
Horsepower	*Speed*	*Miles per gal.*
1.7	6	14
3	8	14
5	12	15
7½	17	17

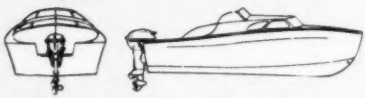
LIGHT UTILITY RUNABOUT has a planing hull 11 to 14 feet long, needs five hp. minimum.

Horsepower	*Speed*	*Miles per gal.*
5	10	20
7½	15	16
10	20	18
15	23	13
25	30	10

LARGER RUNABOUT, 15 to 18 feet long, may require 10-hp. motor to begin planing, even with only one person aboard.

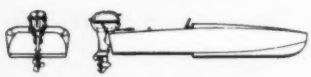
Horsepower	*Speed*	*Miles per gal.*
10	20	18
15	22	12
25	28	10
30	32	9





OUTBOARD CRUISER usually has a planing hull, is often 18 to 21 feet long. The figures apply to single-motor rigs.

Horsepower	*Speed*	*Miles per gal.*
15	15	10
25	20	8
30	24	7



UTILITY HYDROPLANE or racer carries two people over a wide speed range:

Horsepower	*Speed*	*Miles per gal.*
7½	20	18
10	25	24
15	30	13
25	35	10
30	40	10

the stern. The after part of the hull also usually curves upward a little. Examples are rowboats, canoes, dinghies, kayaks and sailboats.

A planing hull is designed to *ride* the surface, and characteristically has a broad, flat bottom at the stern. Examples include modern outboard cruisers, hydroplanes and high-performance runabouts. Do not judge by whether a boat has a round, flat, or V bottom in the midships area; the identifying characteristic of a planing hull is a broad, flat bottom from the midsection back.

Traits. The two hulls vary greatly in power requirements. A displacement boat has excellent load-carrying capacity, but it is not designed for high speeds. It has a natural "critical" speed beyond which it cannot be pushed except by big increases in power.

An overpowered displacement hull tends to squat at the stern, drag a large bow wave behind, and behave crankily. The best motor for such a boat, generally speaking, is the smallest one that will bring it up to or near its critical speed. Adding more power beyond that will increase the top speed very little and may harm the handling.

A planing hull is different in that it has a definite minimum power requirement, which *varies with load*. It has to be pushed along fast enough to get into planing position, or else it will simply lean back and wallow along. The best motor for such a hull is one that will bring the boat into planing position with the average number of passengers it will carry. This may cover a considerable range: A small runabout may need only five or 7½ hp. to plane with one aboard, but if it is loaded with four people and miscellaneous accessories, it may need 12 to 16 hp.

Certain displacement hulls, notably flat-bottomed skiffs and canoes, *can* be planed by using lots of power with light loading forward. This doesn't mean that it's wise to do it; the dangers of overstrained transoms, uncertain and skiddy turns, and general instability advise against trying it.—*Bob Whittier.*

New on water

1 **See-through sails** give a small-boat skipper safer vision when shaving a buoy in a tight race. Made of Mylar, a flexible plastic only a few thousandths of an inch thick, the experimental new sails are strong, light, and so smooth as to reduce the amount of air drag considerably.

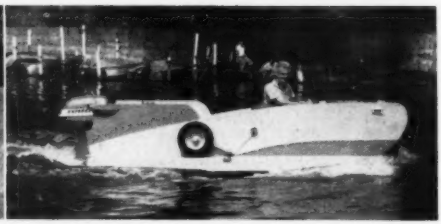
2 **Pontoon put-put** carries two comfortably on a tilted seat, and draws scarcely more water than a canoe. The "Water-Skeeter" also comes in a pedal-powered version with a chain-driven paddle wheel. The two nine-foot pontoons are fiberglass.

3 **Fog-bound** yachtsmen can now emit 115-decibel blasts with the portable foghorn at right. It can be easily heard for more than a mile. Powered by Freon gas, the instrument will give 450 two-second blasts per charge.

4 **Snags and shallows** hold no terrors for air-driven boats, which when planing can run on as little as one inch of water. Models ranging from 190-hp., 55-m.p.h. speedboats to little two-hp. clamp-on outboard motors are available. The latter job weighs 39 lb.

Please turn the page for makers' addresses

5 A floating trailer, this British-made amphibian slides off its steel chassis into the water when locking pins are removed. Pulled back on the chassis by a winch, it's a trailer again. It sleeps three, is driven by a small outboard, and weighs 1,288 lb. It is 14′ 2″ long, 6′ 8″ wide, and 8′ high.

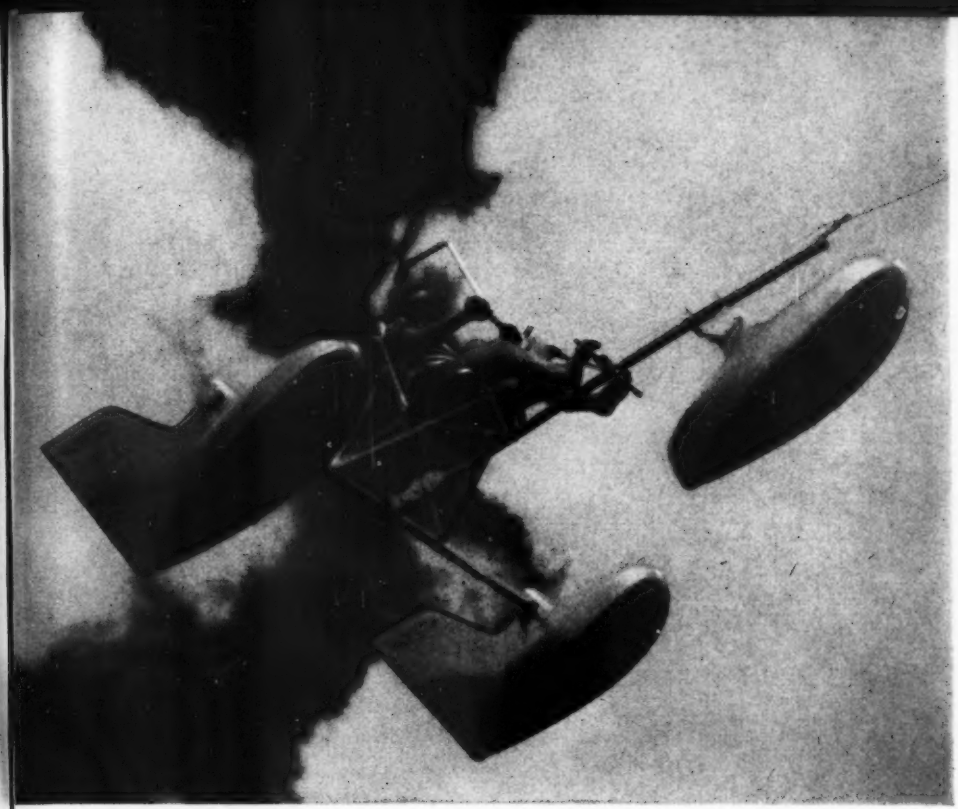


6 A trailing boat built by Howard K. Dearborn trundles smoothly along the road on two rubber tires. Arriving at water, you simply pull a lever to retract the road gear. Afloat, the boat rides on a pair of 30″ pontoons 12′ long. The fiberglass-covered plywood craft is capable of a fine turn of speed on water.

7 Floating boathouse uses an ingenious wrinkle: the weight of the hinged metal roof helps lift the boat up out of water. The boat is docked between the two rows of welded drums, and lifting cables are snapped on the bow and stern. Then the roof is lowered, hoisting up the hull inside.

8 For moist fun, the 85-pound "Water Skimmer" is tough to beat. Its Styrofoam-filled plywood pontoons supply flotation, and holes in the transom let out the water it ships. A 16-hp. motor sends it skipping along at 40 m.p.h. It costs about $120 without the motor and controls.

Further information on these products can be obtained from: 1. Albert R. Pierce Jr., Delano Road, Marion, Mass.; 2. Dallas Engineers, Inc., Dallas, Pa.; 3. Falcon Alarm Co., Inc., Summit, N. J.; 4. Airboats, Inc., 6432 Hampton Ave., St. Louis 9; 5. Amphibian Ltd., Conduit Lane, Hoddesdon, Hertfordshire, England; 6. TrailerBoat, c/o Howard K. Dearborn, Berea, O.; 7. Northwest Georgia Enterprises, Rome, Ga.; 8. Stillwater Lumber & Woodworking Co., Stillwater, Minn.



SPRING BOAT FAIR

You can even fly behind an outboard

TOWED behind an outboard runabout, this contraption combines water skiing and flying thrills.

The first public demonstration of the new rotary-wing kite took place recently at Florida's Cypress Gardens. With a surface breeze helping, it became airborne at a wind speed of about 25 miles an hour. A speed of 30 is necessary for adequate control in maneuvering.

The Hydro-Glider, as its inventor, Igor Bensen, has named it, flies in the same way as the land-based version of his man-carrying whirlybird kite (PSM, July '54, p. 98). He merely attaches his tow rope to a boat instead of an automobile. The boat's speed turns a free-wheeling, two-bladed rotor. That creates the lift necessary for flight.

Flying over water eliminates the problem of finding a landing site; if the tow rope should break, the Hydro-Glider just coasts gently down.

Bensen says that learning to fly his whirlybird entails only a few hours of instruction. He "checked out" a novice in Florida for solo flight, in one instance, in three hours.

The machine costs close to $1,000 complete at the factory in Raleigh, N. C., but it can be built from plans if the basic mechanical components are bought.

How to keep your

If a bent blade is cutting down your motor's performance, this simple jig will help set it right.

By Phil McCafferty

WHEN the blades of a boat propeller do not cut the water at exactly the same angle, or the angle is wrong, trouble aplenty will result. One bad blade of a small prop, bent so little that the eye can't detect it, can cut down top speed, increase fuel consumption, and cause exasperating vibration. It can happen easily, too. Grounding on a sandbank, nudging a log or rock, or careless beaching are common ways in which props get bent.

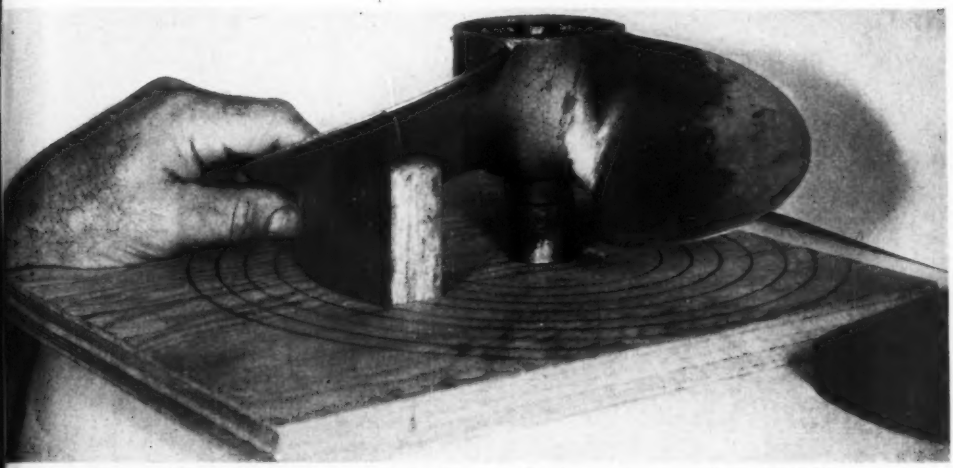
The curves of a prop blade may be subtle to the eye, but they are not hard to capture on a set of simple templates or gauges, made as shown below. The job takes no special equipment, and can be done in an evening, for little cost.

With the checking gauge set on its own circle,

Triple threat. There are three separate uses for these templates: (1) You make a set to match a new, accurately pitched prop and then put them aside for

DRAW CIRCLES on a piece of ¾" plywood. Diameters between 6" and 12" are most useful for outboard props. In the center, fit a perpendicular rod that can be sleeved to fit your props. Lay out on paper a series of right triangles. The base of each is the pitch of the prop in inches (usually stamped on the hub or listed in the handbook). The altitude of each is pi times the diameter at which the gauge is used. Snip out a piece of tin plate that duplicates the apex of each triangle. Then bandsaw blocks curved for each pitch diameter that you are gauging.

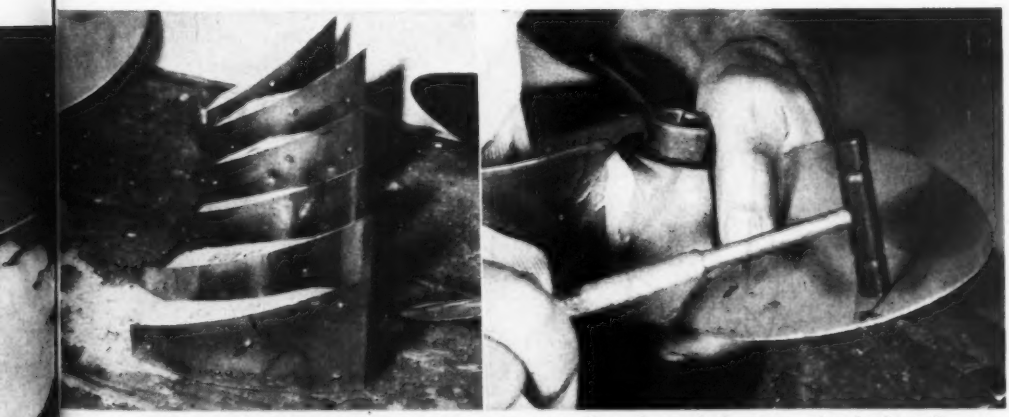
propeller shipshape



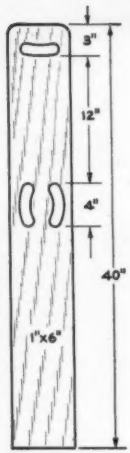
each prop blade is turned up against the curved edge. Any error in pitch is then apparent.

future use as a repair guide when a blade gets bunged up; (2) you make several sets in various standard pitches, and use them to identify the pitches of unmarked, unknown props; (3) if you suspect that your motor-hull combination ought to go better, you make several sets of slightly

[*Continued on page 268*]



ONE SET of at least three or four gauges is desirable for each pitch to be tested. Nail each tin triangle to a base block curved for its diameter, smoothly bending the metal to match. Mark each gauge for pitch and diameter. In the typical set of gauges shown above, note how the angle lessens as the checking diameter increases. In use, test each prop blade at each diameter. When you find an error, reshape the blade by cautious work with a soft-faced hammer, rechecking the pitch at frequent intervals. Do not bend a blade more than is necessary.

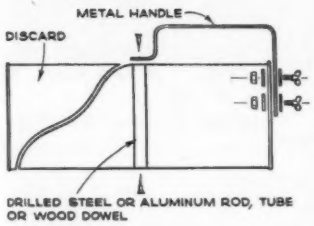


1 **Regular paddles,** so handy for docking and mooring, seem to get stepped on and broken with dismaying ease. But these homemade substitutes are tough, and even if one does break, another can be made in a few minutes. Use a pine one-by-six, and round off the edges of the handgrip holes.

Seven hints for

3 **A gallon of concrete,** with a U bolt embedded in the wet mix, serves as a fine fishing anchor for a small boat. The black tape, wound at one-foot intervals on the anchor rope, gives you a simple indication of depth.

4 **Hauling too hard** on a boat-trailer tie-down may spring the hull; not hauling hard enough makes for uneasy trailing. The remedy: Cut and fit a batten to take the strain at the anchor point, and then snug it up tight.



2 For fast bailing, a rectangular scoop is good because it lets you dip the water up and out in one motion. A one-gallon antifreeze can, cut as above, forms the body. Fold in the raw edges and crimp them flat. Fit a center support of wood or nonrusting metal and attach a handle. If you keep the bailer painted, it'll last several seasons.

do-it-yourself sailors

5 Don't trust dogs on a trailer winch to stay engaged on a long haul over bumpy roads. A heavy rubber band cut from an old inner tube will lessen your fears that the boat may start cruising on land. The looped band also helps to eliminate some trailer rattles.

7 A bait bucket or fuel container can set up a terrific racket on the bottom of a metal-hull boat at certain engine speeds. Rather than trying to wedge it quiet, simply slip an old rubber sink mat under the offender. It not only hushes the clatter but keeps the can from creeping about. Auto floor mats or old nonskid mats from bathtubs or showers will also do the job well.

6 An alligator clip, obtainable in an electrical-supply store, is useful in any fisherman's tackle box. A one-ounce bell sinker attaches easily to the wire screw; the jaws clip quickly to the end of a leader. This gives a sounding line to measure depth when in murky water.

OUTBOARD New ideas

1 Motor Power to Tilt Props. A motor coupled to this outboard-propeller mechanism would spin the blades, rotate them (for steering) or jack them out of the water to prevent fouling. To apply lifting power, the operator would throw a lever that would engage a worm and gear and uncouple the propeller drive. The worm design would limit the lift.

2 Pump-Up Boat to Sport a Motor. Until you put in the air, this inflatable fabric boat would take less car space than its motor. Doubled on themselves at the rear, the pontoons would support a rigid mounting board to spread motor weight over a large area.

3 Weed Cutter to Free Props. Clamped to any outboard, the blades of this cutting attachment would ride ahead of the props. They'd slice through weeds to prevent fouling of the shaft. The rudder-like blades, says this inventor, would also improve steering.

U.S. patents on these inventions have been granted to: 1. Peter K. Dewhurst, London, England; 2. Thomas A. and Helen V. Potts, Bridgton, Maine; 3. Harry F. Cavanaugh, Chicago; 4. Doty M. Steele, Los Angeles; 5. Grover D. Johnson, Baldwinsville, N. Y.; 6. Walter H. Tinker, Cincinnati.

from the inventors

SPRING BOAT FAIR

4 Surfboard to Pull Itself. With a motor mounted in the well of this surfboard, a water jockey would have no need for a tow boat. Deflecting baffles around the motor would prevent water from splashing up through the well opening. A downward slope of the hull behind the rider would lift the back of the board at high speeds to keep it level and high on the water.

5 Hydraulic System to Steer Outboard. Instead of a clutter of drums and cables, the boat below would use thin tubes to link motor and steering wheel. The piston of one hydraulic cylinder would be sprocketed to the wheel. Fluid pressure, transmitted to a second cylinder, would turn or tilt a motor mount.

6 Jets to Boost Prop Power. Standard screw propellers waste a lot of energy agitating water instead of pushing a boat, so this inventor would enclose turbine-like vanes in a special housing. Water flowing in at low pressure would be thrust out at high velocity. Such jets, he says, convert more power into push.

AN OLD HAND WITH HYDROS, Rogers says that this one likes motors in the 6-to-10-hp. range. His advice to novices: Get in some time at part throttle until you get the feel of the thing; avoid rough water or large wakes from other boats.

By John Rogers

FOR pure unadulterated thrill, it's hard to beat blasting along in a racing hydroplane. The sensation of speed is terrific, and there are constant opportunities for testing your skill and your nerve.

The speedy cockleshell shown here and on the cover has four big virtues:

• It can be built in a couple of weeks of spare-time work by anyone who can pilot a screwdriver and saw. There is *no* tricky table of offsets, *no* need for full-size plans, and *no* steam-box wrassle with the curves.

• It's cheap. I spent about $60 for paint, screws and lumber (specifying first-grade mahogany), and I didn't use any workshop scrap. If your shop has the normal accumulation of odds and ends, you might cut the cost of the hull by a third. The wheel, throttle, fin and fittings may tack about $25 to the bill.

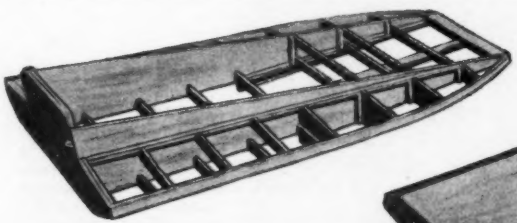
• Designed for 10-hp. motors, it doesn't need big, expensive power plants. Even with a little 6-hp. rowboat kicker (about

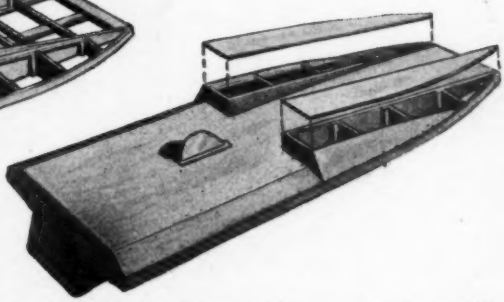
[Text continued on page 118]

How to build this outboard hot rod

For less than $100 and a couple of weeks of easy work, you can build this high-speed hydroplane. It goes like the wind with just a modest motor.

Fancy craftsmanship isn't needed for this hull





TWO TRIANGULAR GIRDERS (above) run from the hydro's stern to bow. The sponsons and the after plane (right) are the only hull parts that are wetted at speed.

See following pages for construction details

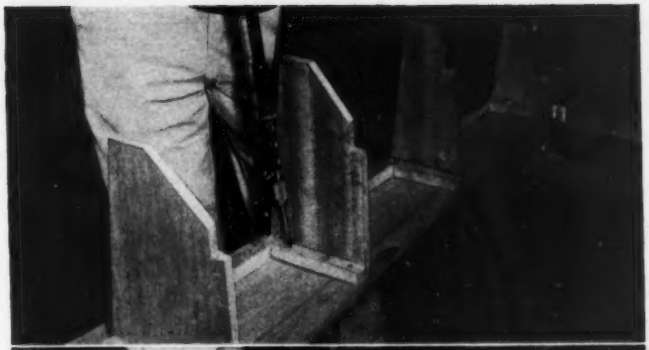
1 FRAMING JIG is laid out on a straight, true, two-by-six. Shape of top edge is a straight line from stern to a point 1″ down at station 4; and a second straight line from here to a point 4″ down at bow. With a plane, lightly dub off angle change just forward of station 4. The notches are 1¼″ deep.

2 FRAMES 4, 5, 6, 7, which differ only in upturn at the ends, are sawed out of ½″ stock. Then they are lined up, clamped together, and planed dead flat on the bottom. Before loosening the clamps, mark and cut notches for the keel and chine battens.

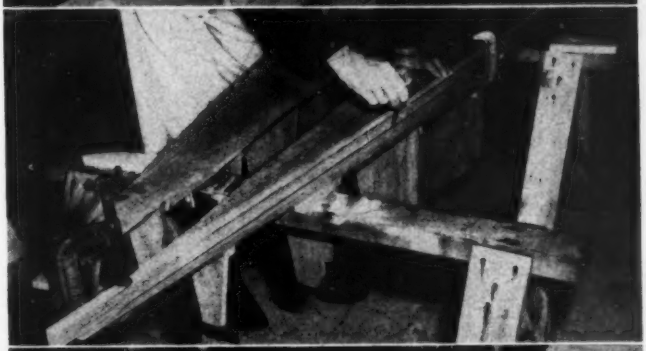
3 TWO IDENTICAL GIRDERS are cut from ½″ stock. Lay out one on a plank 14″ wide, or on a piece of ½″ marine plywood, and use it after cutting as a pattern for the second. Mark deck line on what will be the outer side of each. Clamp them together and notch for frames 4, 5, 6 and 7.

4 A DECK BATTEN, its top beveled 8 deg., is glued and screwed to the outer side of each girder. (Don't forget that you have a left one and a right one.) Use waterproof glue and 1¼″ No. 8 flathead screws spaced 12″ apart.

5 **STUB FRAMES** in pairs are sawed out for stations 1, 2, 3 and 4. Support blocks ¾" square are glued and screwed to each. Then each stub frame is glued and screwed to the outer face of its girder. They are aligned at 90 deg. to the deck batten, not to the bottom.



6 **BOTTOM LINE,** forward of the sponson ends, is established this way. Each girder is flipped over and a flexible batten clamped in place as shown. Bottom line of the after plane is dead straight; that of the forward plane is nearly so, but it does have a slight curve forward of station 4.

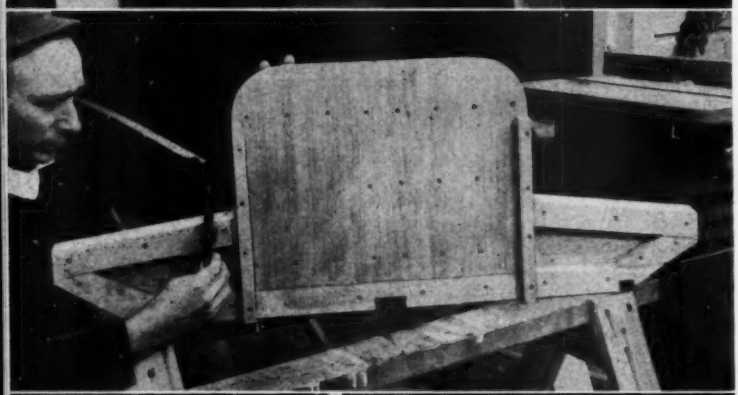


7 **A BATTEN** 44½" long is glued and screwed to the inside of each girder along this forward bottom line. It starts 3" short of the girder tip, to leave room for the bow block.

8 **SET ON SAWHORSES,** the girders are carefully squared up 19" apart. Then frame No. 4 is glued and screwed to its stub frames. Throughout construction, keep checking to make sure that the bottom will be true and unwarped.

[*Please turn the page*]

9 BOW BLOCK, glued up from two pieces of ¾"-by-3"-by-19" stock and then tapered and notched for the keel batten, is attached between girders. Note the short upright blocks that are glued and screwed to the inside of each girder, to help in securing the deck beams and bottom frames at stations 1, 2 and 3.

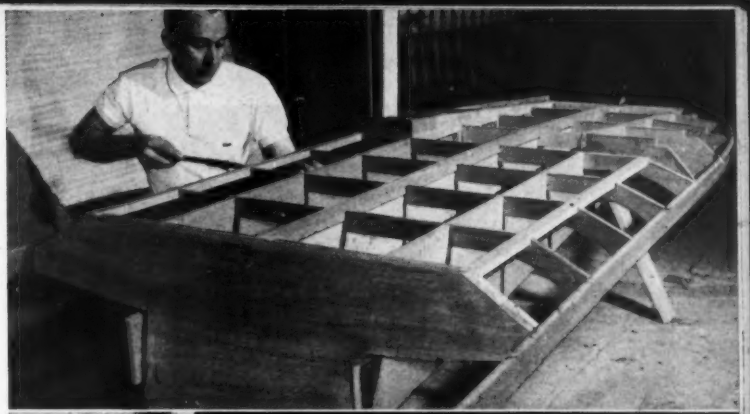


10 RUGGED TRANSOM is a must; it will take lots of punishment. This one is built up: two pieces of horizontal-grain ¾" mahogany for the rear part, doubled in the center section only with two vertical-grain pieces. Marine plywood would do as well. Bottom, deck, and bevel-chine members are added, notched for keel and chine battens. (The notches are not cut through the transom.) Also attached are two vertical strips to help hold the girders.

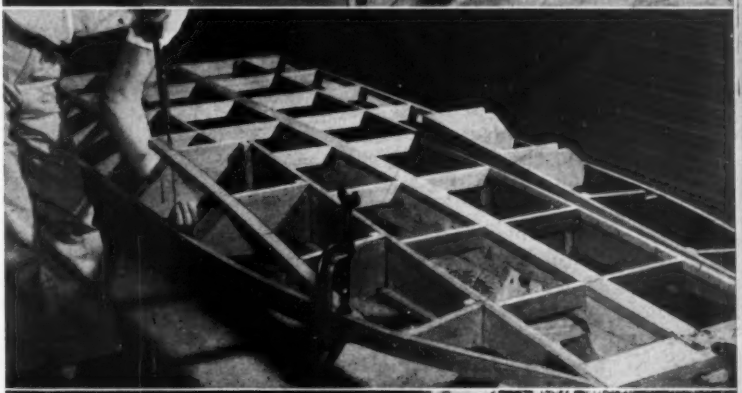
11 FRAMING JIG is first loaded with bottom inside frames 1, 2, 3. Then the girder subassembly is set in place. Transom is clamped on and glued and screwed securely, as are the inside frames in the forward section.

12 SEQUENCE isn't tricky, though it could fool you. Add frames 5, 6 and 7, and then attach the keel batten, taper-cut to fit in the bow-block notch. Keep checking flatness of surfaces that will form the bottom plane.

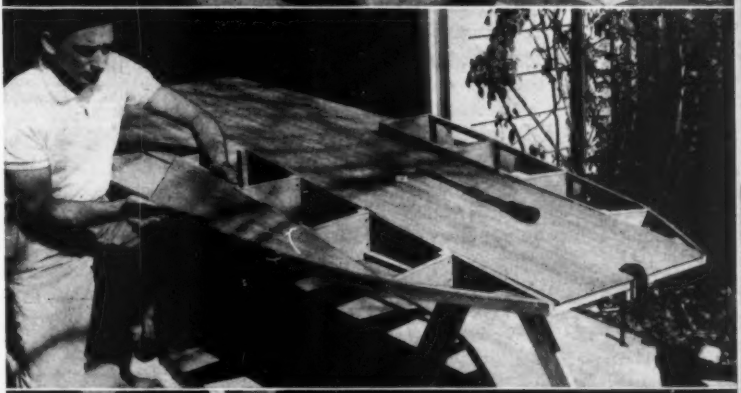
13 CHINE BATTENS come next. The lower chine batten being attached here is beveled after assembly. The main chine battens are attached at the bow first and then bent back. No wood steaming or soaking is necessary.



14 ON THE SPONSONS, lower chine battens run from the main chine battens back as far as the step. Attach first at the forward end and work back. All of the battens are carefully planed to produce chamfers against which the plywood planking can be fastened.

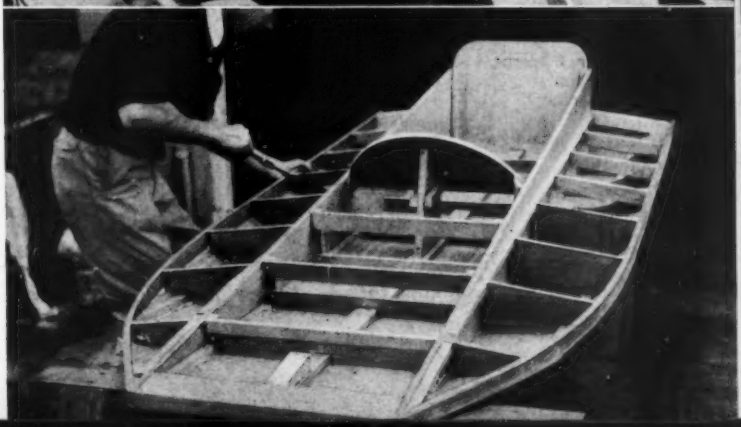


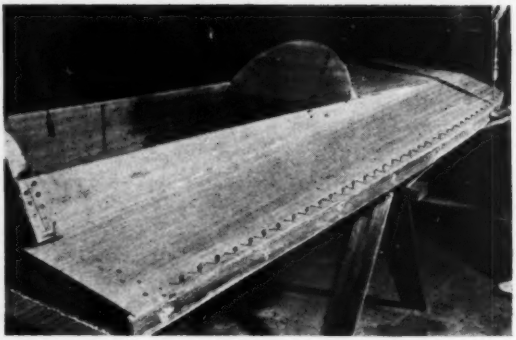
15 ONE 4'-by-8' SHEET of ¼" marine mahogany plywood will plank the bottom if you cut it for minimum waste. In place of glue author used a rubber mastic sealer that makes a slightly flexible watertight joint. Screws are 1" No. 6 flathead, spaced 2" apart. Begin with the bevel-chine planks. Then plane edges flush with the bottom and add the one-piece bottom plank. Use the same sequence with sponsons.



16 WHEEL MOUNT, set at 45 deg., is installed just forward of frame No. 4. Brace it strongly; you'll be hanging on to it for dear life. Deck beams are added at frames 5, 6 and 7. Wedge block on the keel batten near the bow is for screws of the carrying handle.

[*Please turn the page*]



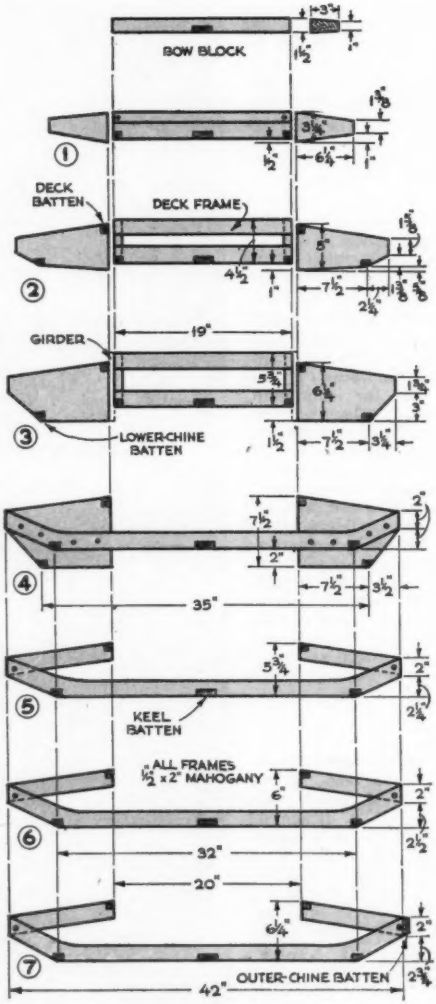


17 DECK OVER the raised center section first and then the two sides. Shape a cowling of .040" dural and attach to the wheel mount and deck. Sand the entire hull carefully before applying finish. Add the aluminum fin and a ¼"-plywood floorboard; rig the wheel and the crash throttle. Then you're ready to head for the water.

the minimum size), it'll scoot along at about 25 m.p.h. With an ordinary 10, it'll probably outrun the most pompous inboard on the lake. And with one of the hot under-20-cubic-inch jobs made for stock racing, it'll top 50 m.p.h.

• Less than eight feet long and four wide, it can be carried, handled and launched with ease. If you make the fin easily detachable, the hull is a cinch for car-topping.

Tech specs. The boat is a three-point hydroplane, modified so that the sponsons—the small forward steps—are tucked under the hull instead of being on each side in the conventional manner. It conforms, if you want to go racing, to the Class A-B specifications for stock hydros (details obtainable from the National Outboard Association, 707 Market Street, Nashville, Tenn.). Even if you aren't a cup hound, this quick little shin-



WHAT YOU'LL NEED

Bottom, deck, floorboard:	2 panels, ¼"x4'x8' marine plywood
Transom, keel and chine battens, bow block, misc. cleats:	1 piece, ¾"x12"x14' Philippine mahogany
Frames, deck beams, outer chine battens, etc.:	1 piece, ½"x12"x14' Philippine mahogany
Girders:	2 pieces, ½"x14"x8' Philippine mahogany
Framing jig:	1 piece, 2"x6"x8' fir
Cowling:	.040"x16"x26" dural
Cadmium-plated screws:	7 gross 1" No. 6; 2 gross 1¼" No. 8; 1 gross, 1½" No. 8.

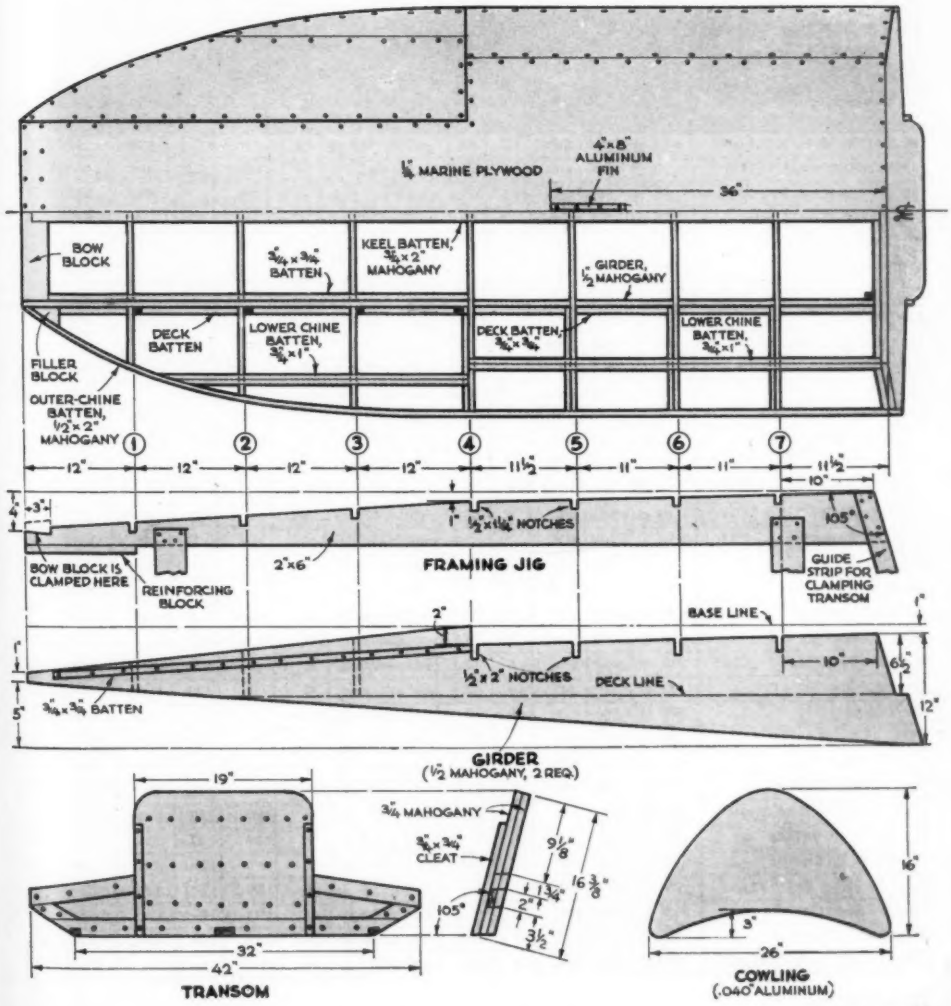
Waterproof resin glue, mastic batten and seam sealer, clear spar varnish, enamel.

gle will give you plenty of excitement zipping about home waters.

Facts of life. People not familiar with small hydros should be counseled that this is no craft for rough weather or for picnic cruising with lady friends. Its one-man cockpit is 19 inches wide. You drive kneeling on a sponge-rubber pad. A life jacket is uniform-of-the-day; and an automatic crash throttle, to cut the engine if you bounce gaily overboard, is a must. The boat has no amenities and virtually no utility—just pure fun.

The boat can be built in the basement or garage—anywhere that you have about 10 feet of clear space. The job will go much easier if you have a spiral screwdriver and a screw-hole drill. A table saw or bandsaw is useful but not essential.

For a "fast bottom," three coats of clear spar varnish serve nicely. Topsides can be finished in any way that suits your fancy. Costly marine enamels are not necessary, because a hydro is not usually left in the water or exposed to weather except when it's in use. END



SPRING BOAT FAIR

Buyer's guide to

HIGHER horsepower, slick styling and colors, and new convenience gadgetry—these are the lures built into the 1956-model outboard motors. The parallel with autos is no coincidence; the outboard makers have been eying Detroit's mass-market success.

By boosting compression ratios, most manufacturers have coaxed out a few more horsepower than you got last year.

Large Motors 20 HP. to 75 HP. MAKE	HORSEPOWER	NO. OF CYLS.	DISPLACEMENT (cubic inches)	PROPELLER		FUEL TANK		ENGINE WEIGHT (lb.)	MANUAL OR ELECTRIC START	PRICE (f.o.b. factory)
				DIAMETER & PITCH (in inches)	NO. OF BLADES	CAPACITY (gallons)	TYPE (integral or remote)			
BROOKLURE Model 22D11	25 @ 4,000 r.p.m.	2	35.7	10.4 x 12.5	3	6	rem.	119	man.	$430
BROOKLURE Model 22DE11	25 @ 4,000 r.p.m.	2	35.7	10.4 x 12.5	3	6	rem.	129	elec.	$520
BUCCANEER 25-hp. De Luxe	25 @ 4,000 r.p.m.	2	35.7	10.4 x 12.5	3	6	rem.	119	man.	$430
BUCCANEER 25-hp. Electric	25 @ 4,000 r.p.m.	2	35.7	10.4 x 12.5	3	6	rem.	129	elec.	$520
ELGIN Model 5940	25 @ 4,000 r.p.m.	2	37.7	10.4 x 11.5	3	6	rem.	118	man.	$380
ELGIN Model 5960	25 @ 4,000 r.p.m.	2	37.7	10.4 x 11.5	3	6	rem.	129	elec.	$450
ELTO 25	25 @ 4,000 r.p.m.	2	35.7	10.4 x 12.5	3	5	rem.	119	man.	$480
ELTO 25 Electric	25 @ 4,000 r.p.m.	2	35.7	10.4 x 12.5	3	5	rem.	129	elec.	$580
EVINRUDE Big Twin Standard	30 @ 4,500 r.p.m.	2	35.7	10.4 x 12.5	3	6	rem.	113	man.	$462
EVINRUDE Big Twin Electric	30 @ 4,500 r.p.m.	2	35.7	10.4 x 12.5	3	6	rem.	127	elec.	$552
EVINRUDE Lark	30 @ 4,500 r.p.m.	2	35.7	10.4 x 12.5	3	6	rem.	130	elec.	$582
FIRESTONE 30-hp. 3-shift	30 @ 4,200 r.p.m.	2	40.5	10 x 14	2	6	rem.	117	man.	$450
FIRESTONE 30-hp. Electric	30 @ 4,200 r.p.m.	2	40.5	10 x 14	2	6	rem.	127	elec.	$540
JOHNSON Sea Horse 30	30 @ 4,500 r.p.m.	2	35.7	10.4 x 12.5	3	6	rem.	112	man.	$462
JOHNSON Sea Horse 30 Electric	30 @ 4,500 r.p.m.	2	35.7	10.4 x 12.5	3	6.2	rem.	126	elec.	$552
JOHNSON Javelin	30 @ 4,500 r.p.m.	2	35.7	10.4 x 12.5	3	6.2	rem.	128	elec.	$582
MERCURY Mark 25	20 @ 5,400 r.p.m.	2	19.8	not available		6	rem.	75	man.	$395
MERCURY Mark 25E	20 @ 5,400 r.p.m.	2	19.8	not available		6	rem.	85	elec.	$485
MERCURY Mark 30	30 @ 5,400 r.p.m.	4	29.7	not available		6	rem.	110	man.	$480
MERCURY Mark 30E	30 @ 5,400 r.p.m.	4	29.7	not available		6	rem.	118	elec.	$605
MERCURY Mark 55	40 @ 5,400 r.p.m.	4	39.6	not available		6	rem.	113	man.	$605
MERCURY Mark 55E	40 @ 5,400 r.p.m.	4	39.6	not available		6	rem.	121	elec.	$730
OLIVER 35-hp.	35 @ 4,000 r.p.m.	2	42	not available		6	rem.	120	elec.	n.a.
RILEY 75-hp.	75 @ 4,500 r.p.m.	5	127	varies	3	varies	rem.	250	elec.	$1,428
ROYAL 25-hp. De Luxe	25 @ 4,000 r.p.m.	2	35.7	10.4 x 12.5	3	6	rem.	119	man.	$430
ROYAL 25-hp. Electric	25 @ 4,000 r.p.m.	2	35.7	10.4 x 12.5	3	6	rem.	129	elec.	$520
SCOTT-ATWATER 33-hp.	33 @ 4,200 r.p.m.	2	42.2	10 x 14	2	6	rem.	130	man.	$470
SCOTT-ATWATER 33-hp. Electric	33 @ 4,200 r.p.m.	2	42.2	10 x 14	2	6	rem.	140	elec.	$560
SEA BEE 25-hp. De Luxe	25 @ 4,200 r.p.m.	2	32.6	10.4 x 12.5	3	6	rem.	110	man.	$430
SEA BEE 25-hp. Electric	25 @ 4,200 r.p.m.	2	32.6	10.4 x 12.5	3	6	rem.	125	elec.	$520
SEA KING 25-hp. De Luxe	25 @ 4,000 r.p.m.	2	35.7	10.4 x 12.5	3	6	rem.	119	man.	$375
SEA KING 25-hp. Electric	25 @ 4,000 r.p.m.	2	35.7	10.4 x 12.5	3	6	rem.	129	elec.	$455
WIZARD Super Power 25	25 @ 4,000 r.p.m.	4	29.8	not avail.	2	6	rem.	108	man.	$425
WIZARD Super Power 25 Electric	25 @ 4,000 r.p.m.	4	29.8	not avail.	2	6	rem.	120	elec.	$515

1956 outboards

Scott-Atwater's 30-hp. motor of a year ago, which touched off the present horsepower race, is now 33 hp.; the Evinrude and Johnson 25s have jumped to 30 hp.; Mercury has added a 30-hp. model to its line; and Oliver is now offering a 35-horse job.

There's a notable preoccupation with styling and color. Examples: Johnson has retired its traditional Sea Horse green

Medium-Sized Motors 7 HP. to 17 HP.				PROPELLER		FUEL TANK				
MAKE	HORSEPOWER	NO. OF CYLINDERS	DISPLACEMENT (cubic inches)	DIAMETER & PITCH (in inches)	NO. OF BLADES	CAPACITY (gallons)	TYPE (integral or remote)	ENGINE WEIGHT (lb.)	MANUAL OR ELECTRIC START	PRICE (f.o.b. factory)
BROOKLURE Model 12D13	12 @ 4,000 r.p.m.	2	17.9	9 x 11	3	6	rem.	75	man.	$340
BUCCANEER 12-hp. Standard	12 @ 4,000 r.p.m.	2	17.9	9 x 11	3	2	int.	66	man.	$302
BUCCANEER 12-hp. De Luxe	12 @ 4,000 r.p.m.	2	17.9	9 x 11	3	6	rem.	75	man.	$340
BUCCANEER 12-hp. Electric	12 @ 4,000 r.p.m.	2	17.9	9 x 11	3	6	rem.	86	elec.	$430
CHAMPION 7.8-hp. De Luxe	7.8 @ 4,300 r.p.m.	2	9.6	7 x 9.5	2	3.5	rem.	46	man.	$264
CHAMPION 16.5-hp. De Luxe	16.5 @ 4.300 r.p.m.	2	19.9	8 x 11	3	6	rem.	54	man.	$365
ELGIN Model 5970	7.5 @ 4,000 r.p.m.	2	12	8 x 8	2	4.5	rem.	52	man.	$200
ELGIN Model 5890	12 @ 4,000 r.p.m.	2	17.7	8.5 x 8	3	6	rem.	61	man.	$280
ELTO 12 (Canada only)	12 @ 4,000 r.p.m.	2	17.9	9 x 11	3	5	rem.	75	man.	$369
EVINRUDE Fleetwin	7.5 @ 4,000 r.p.m.	2	12.4	8 x 8.5	2	4.2	rem.	56	man.	$241
EVINRUDE Sportwin	10 @ 4,000 r.p.m.	2	16.6	9 x 8	3	6	rem.	72	man.	$321
EVINRUDE Fastwin Standard	15 @ 4,000 r.p.m.	2	19.9	9 x 11	3	6	rem.	75	man.	$362
EVINRUDE Fastwin Electric	15 @ 4,000 r.p.m.	2	19.9	9 x 11	3	6	rem.	88	elec.	$452
FIRESTONE 10-hp. 3-Shift	10 @ 4,200 r.p.m.	2	14.8	8.1 x 10	2	6	rem.	59	man.	$300
FIRESTONE 16-hp. 3-Shift	16 @ 4,200 r.p.m.	2	19.9	9 x 9	2	6	rem.	68	man.	$350
JOHNSON Sea Horse 7½	7.5 @ 4,000 r.p.m.	2	12.4	8 x 8.5	2	4.2	rem.	56	man.	$241
JOHNSON Sea Horse 10	10 @ 4,000 r.p.m.	2	16.6	9 x 8	3	6	rem.	71	man.	$321
JOHNSON Sea Horse 15	15 @ 4,000 r.p.m.	2	19.9	9 x 11	3	6	rem.	75	man.	$362
JOHNSON Sea Horse 15 Electric	15 @ 4,000 r.p.m.	2	19.9	9 x 11	3	6	rem.	89	elec.	$452
MAJESTIC 7.8-hp. Gearshift	7.8 @ 4,300 r.p.m.	2	9.6	7.5 x 9.5	2	1.2	int.	47	man.	$235
MAJESTIC 15-hp. Gearshift	15 @ 4,300 r.p.m.	2	19.9	8 x 11	3	6	rem.	54	man.	$335
OLIVER 15-hp.	15 @ 4,000 r.p.m.	2	19.9	9.2 x 11.5	3	6	rem.	75	man.	$360
ROYAL 12-hp.	12 @ 4,000 r.p.m.	2	17.9	9 x 11	3	6	rem.	75	man.	$340
SCOTT-ATWATER 7½-hp.	7.5 @ 4,200 r.p.m.	2	11	8 x 7	2	6	rem.	49	man.	$246
SCOTT-ATWATER 10-hp.	10 @ 4,200 r.p.m.	2	14.8	8.1 x 9.5	2	6	rem.	58	man.	$306
SCOTT-ATWATER 16-hp.	16 @ 4,200 r.p.m.	2	19.9	9 x 10	2	6	rem.	75	man.	$356
SCOTT-ATWATER 16-hp. Electric	16 @ 4,200 r.p.m.	2	19.9	9 x 10	2	6	rem.	84	elec.	$446
SEA BEE 12-hp. De Luxe	12 @ 4,000 r.p.m.	2	17.9	9 x 11	3	6	rem.	66	man.	$340
SEA KING 12-hp. De Luxe	12 @ 4,000 r.p.m.	2	17.9	9 x 11	3	6	rem.	75	man.	$285
SEA KING 12-hp. Electric	12 @ 4,000 r.p.m.	2	17.9	9 x 11	3	6	rem.	86	elec.	$365
VOYAGER 15-hp. Gearshift	15 @ 4,300 r.p.m.	2	19.9	8 x 11	3	6	rem.	54	man.	$335
WIZARD Super 10	10 @ 4,000 r.p.m.	2	19.8	not avail.	3	6	rem.	62	man.	$240
WIZARD Powermatic 12	12 @ 4,000 r.p.m.	2	19.8	not avail.	2	6	rem.	72	man.	$300

in favor of "holiday bronze," and Mercury is proudly proclaiming that its styling was awarded a gold medal from the Fashion Academy.

Gearshifts, electric starting, remote fuel tanks and provision for remote controls have spread widely. Half the *small* motors now come with gearshifts, and many of the motors can be easily hooked up to remote controls. In the medium-sized range, shifts and remote tanks are almost universal, and you can get electric starting on many. On big motors you can get the works, of course.

Rope starters may follow auto cranks into oblivion if the Evinrude Lark and Johnson Javelin start a trend: They have no manual starters at all. These two makes also use a neat trick on their manual-starting models. The plate or drum on which the starting cable winds up is now oval-shaped instead of round—to give extra leverage as the compression comes up.—*Erik H. Arctander.*

Small Motors 1.7 HP. to 6 HP.				PROPELLER		FUEL TANK				
MAKE	HORSEPOWER	NO. OF CYLS.	DISPLACEMENT (cubic inches)	DIAMETER & PITCH (in inches)	NO. OF BLADES	CAPACITY (gallons)	TYPE (integral or remote)	ENGINE WEIGHT (lb.)	GEARSHIFT (fwd.-neut.-rev.)	PRICE (f.o.b. factory)
BROOKLURE Model 3D13	3 @ 4,000 r.p.m.	1	5.3	6.4 x 6.9	2	.5	int.	30	none	$127
BROOKLURE Model 5S12S	5 @ 4,000 r.p.m.	2	8.8	7.5 x 7.3	2	.8	int.	45	none	$164
BROOKLURE Model 5D12	5 @ 4,000 r.p.m.	2	8.8	8 x 7.3	2	.9	int.	52	f-n-r	$205
BUCCANEER 3-hp. De Luxe	3 @ 4,000 r.p.m.	1	5.3	6.4 x 6.9	2	.5	int.	30	none	$127
BUCCANEER 5-hp. Standard	5 @ 4,000 r.p.m.	2	8.8	7.5 x 7.3	2	.8	int.	45	none	$164
BUCCANEER 5-hp. De Luxe	5 @ 4,000 r.p.m.	2	8.8	8 x 7.3	2	.9	int.	52	f-n-r	$205
CHAMPION Guide Four	4.2 @ 4,300 r.p.m.	1	5.8	7.5 x 6	2	1.2	int.	42	none	$175
CHAMPION Guide Six	6 @ 4,300 r.p.m.	2	9.6	7.5 x 9	2	1.2	int.	46	f-n-r	$220
ELGIN Model 5821	2 @ 4,000 r.p.m.	1	3.7	6.5 x 4	2	.6	int.	28	none	$ 94
ELGIN Model 5950	5.5 @ 4,000 r.p.m.	2	10.6	7.5 x 7	2	4.5	rem.	52	f-n-r	$185
ELTO 3 (Canada only)	3 @ 4,000 r.p.m.	1	5.3	6.4 x 6.9	2	.4	int.	30	none	$145
ELTO 5 (Canada only)	5 @ 4,000 r.p.m.	2	8.8	8 x 7.3	2	.7	int.	52	f-n-r	$230
EVINRUDE Lightwin	3 @ 4,000 r.p.m.	2	5.3	6.1 x 6.3	2	.7	int.	32	none	$146
EVINRUDE Fisherman	5.5 @ 4,000 r.p.m.	2	8.8	8 x 7.3	2	4.2	rem.	51	f-n-r	$216
FIRESTONE 3.6-hp. Non-Shift	3.6 @ 4,000 r.p.m.	1	6.2	7.5 x 6	2	1.	int.	36	none	$115
FIRESTONE 5-hp. 3-Shift	5 @ 4,200 r.p.m.	2	7.5	7.5 x 6	2	3.5	rem.	42	f-n-r	$200
JOHNSON Sea Horse 3	3 @ 4,000 r.p.m.	2	5.3	6.1 x 6.3	2	.7	int.	32	none	$146
JOHNSON Sea Horse 5½	5.5 @ 4,000 r.p.m.	2	8.8	8 x 7.3	2	4.2	rem.	51	f-n-r	$216
LAUSON Single	3 @ 4,000 r.p.m.	1	6.6	7.5 x 6	2	.6	int.	44	none	$143
LAUSON Twin	6 @ 4,000 r.p.m.	2	13.3	8 x 6.5	2	1.2	int.	57	none	$198
LAUSON Twin, Neutral Clutch	6 @ 4,000 r.p.m.	2	13.3	8 x 6.5	2	1.2	int.	57	f-n	$224
MAJESTIC Fisherman Special	4.2 @ 4,300 r.p.m.	1	5.8	7.5 x 6	2	1.2	int.	42	none	$175
MAJESTIC M-3N Gearshift	6 @ 4,300 r.p.m.	2	9.6	7.5 x 9	2	1.2	int.	46	f-n-r	$220
MERCURY Mark 6	5.9 @ 4,500 r.p.m.	2	7.2	not available		3.2	rem.	42	f-n	$225
NEPTUNE Mighty Mite	1.7 @ 4,000 r.p.m.	1	3.0	6 x 5	2	.3	int.	17	none	$ 80
OLIVER 5½-hp.	5.5 @ 4,000 r.p.m.	2	9.4	8.7 x 8	3	3.5	rem.	45	f-n-r	$215
ROYAL 3-hp. De Luxe	3 @ 4,000 r.p.m.	1	5.3	6.4 x 6.9	2	.5	int.	30	none	$127
ROYAL 5-hp. De Luxe	5 @ 4,000 r.p.m.	2	8.8	8 x 7.2	2	.9	int.	53	f-n-r	$205
SCOTT-ATWATER 3.6-hp.	3.6 @ 4,000 r.p.m.	1	6.2	7.5 x 6	2	1.	int.	36	none	$115
SCOTT-ATWATER 5-hp.	5 @ 4,200 r.p.m.	2	7.5	7.5 x 6	2	3.5	rem.	45	f-n-r	$220
SEA BEE 3-hp. De Luxe	3 @ 4,000 r.p.m.	1	5.3	6.4 x 6.9	2	.5	int.	29	none	$127
SEA BEE 5-hp. Standard	5 @ 4,000 r.p.m.	2	8.8	7.5 x 7.2	2	.8	int.	45	none	$164
SEA BEE 5-hp. De Luxe	5 @ 4,000 r.p.m.	2	8.8	8 x 7.2	2	.9	int.	49	f-n-r	$205
SEA KING 3-hp. De Luxe	3 @ 4,000 r.p.m.	1	5.3	6.4 x 6.9	2	.5	int.	30	none	$105
SEA KING 5-hp. De Luxe	5 @ 4,000 r.p.m.	2	8.8	8 x 7.2	2	.9	int.	52	f-n-r	$169
VOYAGER Fisherman Special	4.2 @ 4,300 r.p.m.	1	5.8	7.5 x 6	2	1.2	int.	42	none	$175
VOYAGER Gearshift	6 @ 4,300 r.p.m.	2	9.6	7.5 x 9.5	2	1.2	int.	46	f-n-r	$220
WIZARD Super 5	5 @ 4,000 r.p.m.	2	7.2	not avail.	2	3.2	rem.	40	f-n	$190

POPULAR SCIENCE
REG. U. S. PAT. OFF. Monthly

You'll Soon Ride Two-Headed Trains

This push-pull flyer will streak between cities at high speed—"turn around" without moving.

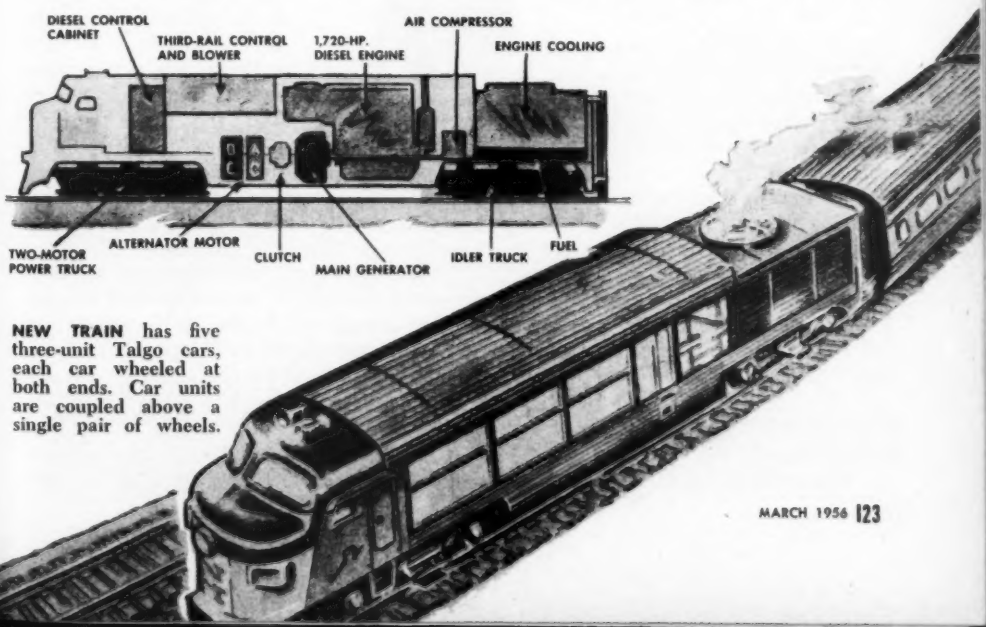
By Henry B. Comstock

A TRACK-HUGGING passenger train with a locomotive at each end—one pulling, the other pushing—may set the pattern for tomorrow's rail runs of less than 300 miles.

This two-headed flyer is scheduled to be skimming up and down the main line of the New York, New Haven and Hartford Railroad late this year. It will knock off the curvy 220 miles between New York City and Boston in three hours—a whole hour less than today's best rail travel time.

Headaches. Winding through the heavily industrial area that joins the two cities, the New Haven has its special problems, including high-density traffic, big commuting loads at each end, and a tunnel-reached terminal in New York's Grand Central Station where exhaust fumes from diesel engines are strictly forbidden.

Added to these problems have been so many recent service delays, some laid to



NEW TRAIN has five three-unit Talgo cars, each car wheeled at both ends. Car units are coupled above a single pair of wheels.

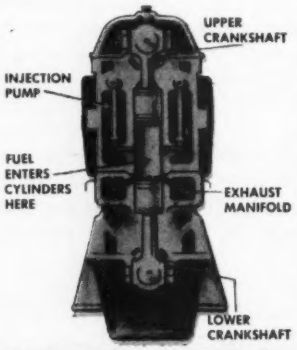
heavy flood damage, that the line is in dutch with its riders and with state regulatory agencies. A glittering new train, the New Haven hopes, may help the line to get off some hooks.

Tough specs. Fancy lightweight Talgo coaches will make up the showpiece train. To pull-push them at record speed will be a pair of locomotives unlike any ever built before. The president of the New Haven Railroad laid down the specifications to Fairbanks-Morse and Co. engineers this way:

"I want a pair of diesels that can run nonstop between New York and Boston. They must be able to go into the electric-only tunnels at Grand Central Station. They must have more horsepower than any of the units now being designed for lightweight trains—enough to take care of all the electrical apparatus in five coaches, and the traction motors.

"And I don't want the locomotives coupled together. I want one at each end of the train, to cut out the 15 miles of switching that it now takes to turn around one of our blue-ribbon trains."

Fairbanks-Morse has come up with all these features in what it calls its "Speed Merchants," a pair of diesel-electrics that are packed with engineering savvy. The tough requirements were met by breaking down the problems one by one in this fashion:



CROSS-SECTION of Fairbanks-Morse engine shows opposed pistons. The two crankshafts are connected with bevel gears and a shaft at engine's rear.

Two heads. Back in the mid-Thirties, the New Haven had experimented with a three-car train having a diesel engine at each end. Called the "Comet," it shuttled between Boston and Providence. Unfortunately, one head didn't always know what the other head was doing. The Comet was plagued by a faulty control system that threatened to buckle the train like an inchworm each time it made a stop.

That won't happen now. A refined control and throttling system will make the two big engines respond to a touch of a controller at either end of the 580-foot-long train. Automatic couplers with 32 contacts are on each locomotive, tying to an electrical "spinal cord" running the length of the cars. Its circuits will keep two locomotives in exact coordination. When turn-around time comes at either station, the enginemen will simply pick up their grips and walk from one cab to the one on the other end.

Opposed pistons. To get the high horsepower the New Haven wants, Fairbanks-Morse is using big, opposed-piston diesels rated at 1,750 horsepower apiece. Each of the eight-cylinder engines is in effect two engines bolted head to head. Each cylinder has two pistons, one plunging downward and the other upward whenever the air-oil mixture fires between them. Their two crankshafts are geared to a common output shaft that drives a big DC generator. The traction motors beneath each locomotive will get 1,200 horsepower with the leftover 550 at each end feeding to the auxiliaries.

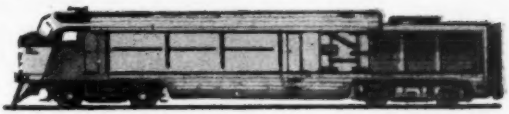
The tunnel trick. The problem of getting into Grand Central's no-diesel trackage seemed to have a simple solution: just shut down the diesels and collect the juice from the third rail system there. That's how it will be done, though the

Radical new train designs like

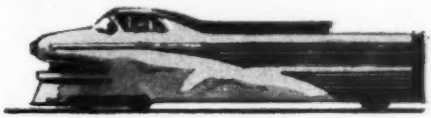
FIVE types of radically new trains are now being built by four car builders, working with three locomotive manufacturers. One or more of these designs may solve the biggest problem that has plagued the railroads —especially the big commuting lines—since World War II: how to make their passenger traffic pay off. All five of the new designs are shown on the opposite page.

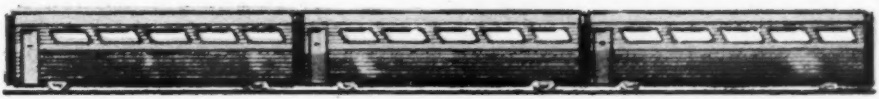
these promise to pare off deadweight and boost rail speeds

TALGO: One train each for New Haven and Rock Island. Coaches by A.C.F.; New Haven engines by Fairbanks-Morse; for Rock Island a GM diesel.



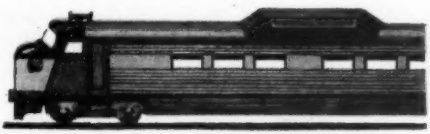
AEROTRAIN: Two trains, with locomotives, built by GM and bought by Pennsy and N.Y. Central. Union Pacific is another prospective buyer.

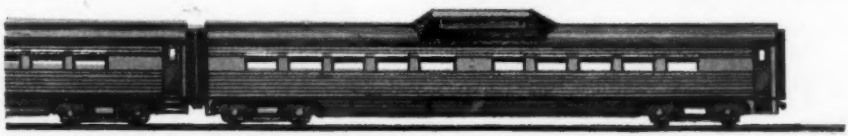




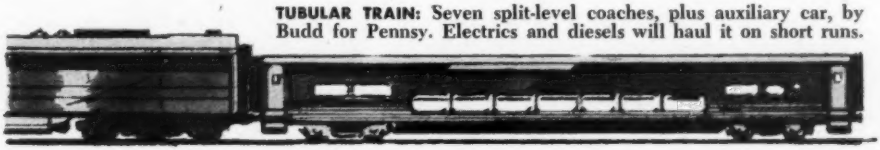
TRAIN X: One train each for N.Y. Central and New Haven. Coaches by Pullman-Standard. Locomotives (diesels with mechanical drive) by Baldwin.

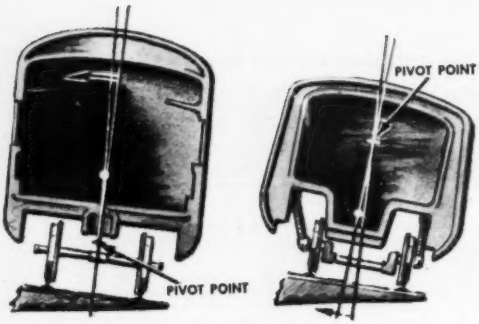
HOT-ROD: One train for New Haven. Six self-propelled diesel coaches by Budd. Cars will have mechanical drive, electric motors for third-rail use.





TUBULAR TRAIN: Seven split-level coaches, plus auxiliary car, by Budd for Pennsy. Electrics and diesels will haul it on short runs.





HIGH CENTER OF GRAVITY gives standard coach (left) an unstable metronome action on curves. Talgo car's low center of gravity and deep springing lets the car bank inward (right).

job was by no means a simple one to engineer.

When Grand Central's 33 miles of tunnel track was electrified about 50 years ago, the power chosen was 600-volt direct current. This, fortunately, is the same kind and voltage of electricity used in all of today's diesel-electric locomotives. So the "Speed Merchants" will manufacture their own juice between Boston and the outskirts of New York City. There the third-rail shoes will pick up the juice from a powerhouse and the train will skim into the tunnel and terminal with its diesels shut off.

The real engineering comes in the way it will be done. Virtually all of today's diesels rev their engines up and down to raise and lower current output, and this is the main speed control of the traction motors. Such a system plainly wouldn't work with the "Speed Merchants": the moment the third-rail shoes hit the high-current 600-volt rail, the whole train would go careening into the tunnel at top speed.

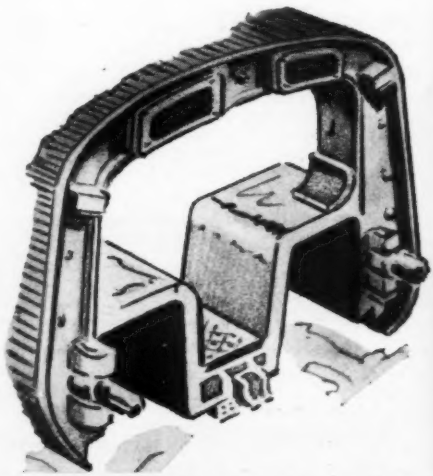
This means that the new train will have to have the same type of controllers that are used on all-electric locomotives. These are switching mechanisms that feed to the traction motors only as much juice as they need for various speeds. Outside third-rail territory, Fairbanks-Morse has elected to stay with this control system, rather than go back to varying diesel speed.

Actually, the big diesels pack so much power in relation to the Talgo train's weight that there's no need to force them beyond a steady 850 r.p.m. Holding them at that constant speed will provide another advantage. They have to supply the coaches with AC power. Since AC generators call for constant speed, with this setup they'll get it.

Change-over. Let's see what will happen as a "Speed Merchant" crosses from diesel to third-rail territory. As the third-rail shoes take over, the big engine and its large direct-coupled generator stop. At the same time, a clutch releases two other generators from the diesel's power train. One is the AC job that supplies the coach equipment. The other is a DC generator that normally supplies juice for locomotive auxiliaries—blowers, fans and air compressors.

Now watch closely. At the instant of change-over, this DC generator stops being a generator and becomes a motor, keeping the AC generator twirling. As one of the Talgo's 400 passengers, you'll still get your heat, light and air-conditioning at the same old stand. The reason the DC generator can be spared for its new assignment, of course, is that the third rail is now supplying power for the locomotive auxiliaries.

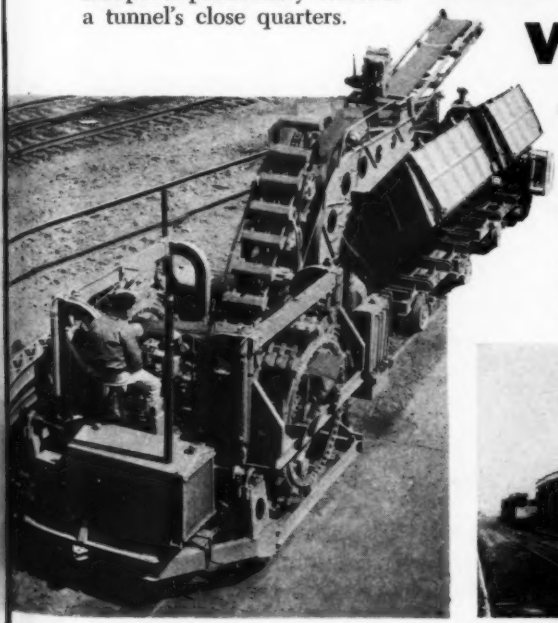
[Continued on page 270]



INTERMEDIATE BULKHEAD of a three-car Talgo coach has studs on sides to align adjacent bulkhead. Pockets below studs let wheels "steer."

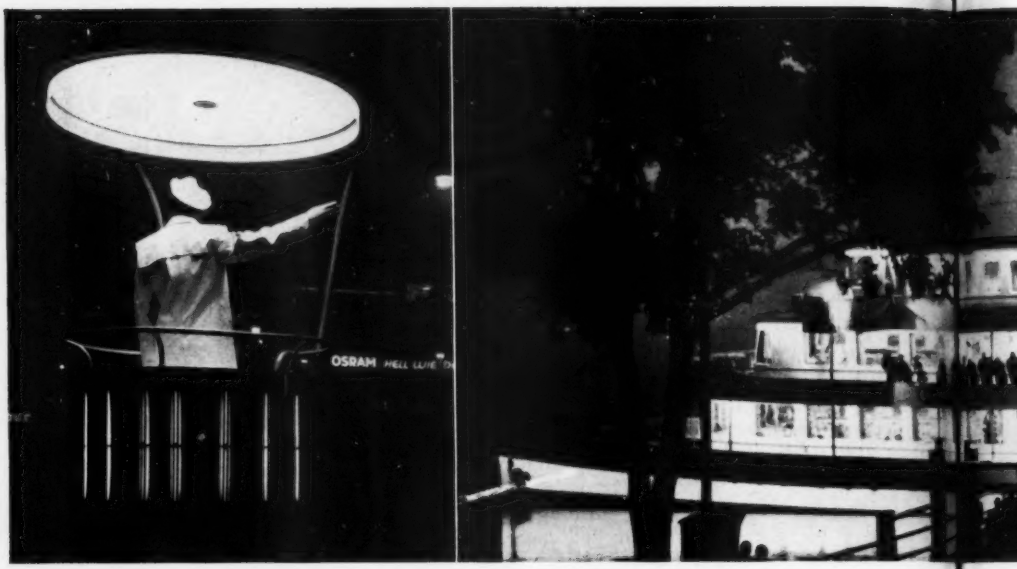
Upsy-Daisy. Unloading coal from heavy freight cars is light work for employees at this West Berlin gas plant. Backed onto the hinged platform of a specially designed hoist (right), a gondola is upended and dumps its 40-ton load in a matter of seconds. Flanged wheels on a moving frame engage the odd-shaped profile of the platform girders to tilt the car upright at increasing angles.

One-Man Scoop. Called the only one of its kind, a new mechanical scoop removes old ballast and replaces it with new along the Southern Pacific tracks in the High Sierra. Its cutters loosen worn ballast, scoop it into conveyor buckets which carry it to two hopper cars. On a second trip, new ballast is dumped from the hoppers on the roadbed. The scooper is particularly useful in a tunnel's close quarters.



Working on the Railroad

'Tween-Car Hauling. Too deep for flatcars, trusses for Philadelphia's Walt Whitman Bridge are rigged between them on swivel-plate couplings at Bethlehem Steel's Pottstown works. Flexible hose connects the air brakes.

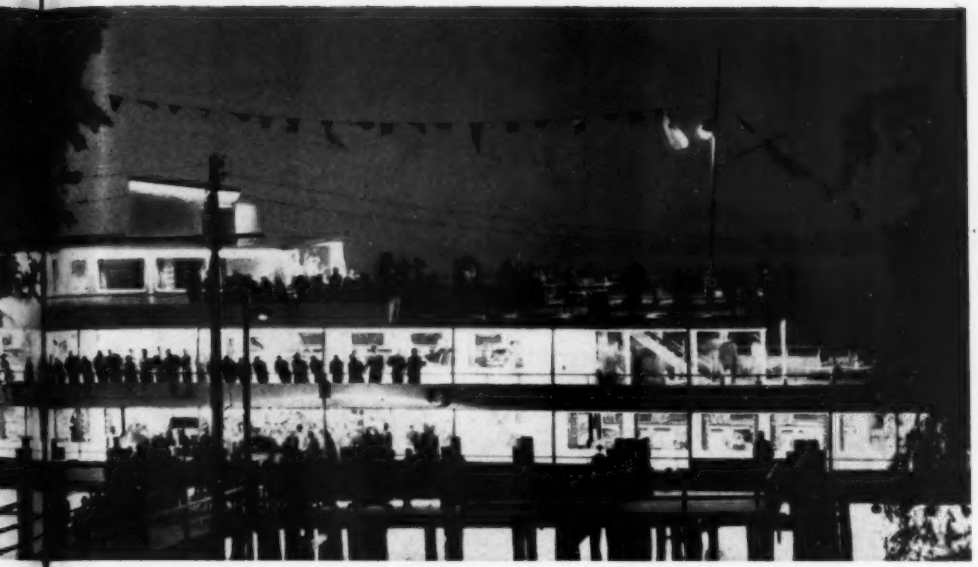


Germans Light Up Cop and Excursion Boat

TRAFFIC directions by the white-garbed policeman under a fluorescent-light canopy (left) are distinctly seen by Munich's nighttime drivers, while 421

One-Finger Typist Copies Art on a Standard Keyboard

HER only concessions to art are a long carriage and a multicolored ribbon when Dona Alberich of Barcelona "paints" with her typewriter. Using standard keyboard characters, she is copying Gainsborough's "Duchess of Devonshire."



fluorescent tubes convert the motorship *Seeshaupt* into a vivid tourist attraction on nearby Lake Starnberg. The 1,200-passenger excursion boat, powered by two 350-hp. diesels, is lighted inside and out by fluorescent lamps, and is also heated by electricity. It is operated by the German Federal Railway.

Compressed Air Controls Plows

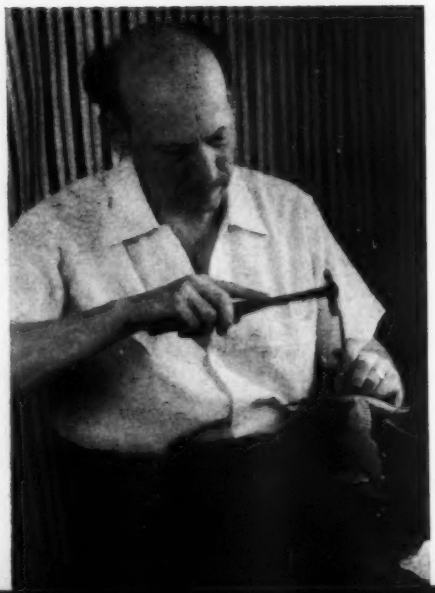
A PNEUMATIC lift in the tubular spine of this new British tractor regulates depth of its front-mounted implements. The air compressor, driven by a diesel in the rear, will also inflate the tires.

Sea-Dozer Herds Floating Logs

THE little boom boat at right, powered by a 15-hp. outboard mounted in a center well, was built by the Weyerhaeuser Timber Company to doze logs into its sawmill slip near Enumclaw, Wash.

What famous cars wore these figures on their radiators? (Check your answers at bottom of page.)

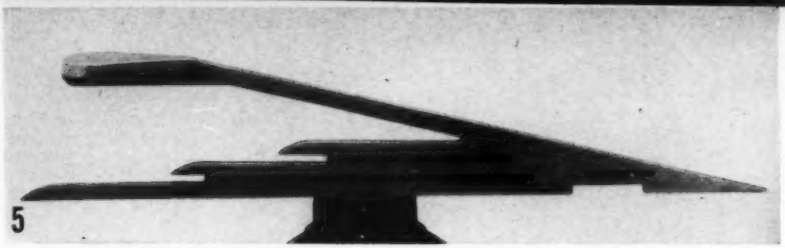
He makes mascots for

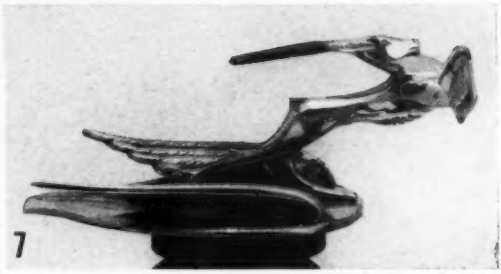


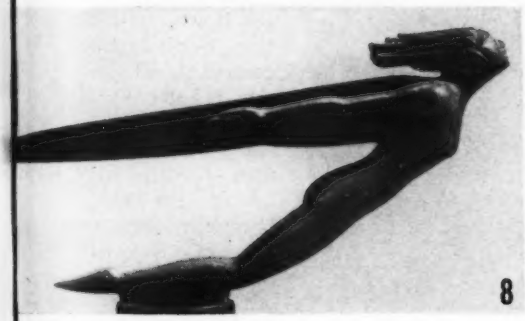
THANKS to the fast-growing fraternity of classic-car fans—car collectors who feel that no really fine automobile was manufactured before 1925 nor after 1942—business is booming for Don Clairemonte, a New York City sculptor, who is shown at left hard at it.

Clairemonte's business is supplying the owners of Cords, Duesenbergs, Stutzes and other classics with authentic replicas of missing radiator ornaments. A classic-car fan himself and proud owner of a well restored '33 Chrysler Imperial, he can turn out a chrome-plated bronze copy of just about any classic radiator ornament—the fans call them "mascots"

Answers: 1. Franklin Six; 2. Stutz; 3. Isotta Fraschini; 4. Pierce-Arrow; 5. Duesenberg; 6. Hoover; 7. Chrysler Imperial; 8. Auburn; 9. Franklin 12.







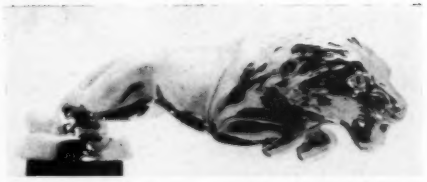
over-age automobiles

—from an Isotta Fraschini winged man for $65 to an Auburn girl for $15.

The mascots pictured above are from Clairemonte's collection of originals, which he uses as patterns.

Clairemonte also creates personal mascots for those who want something individual perched upon their car's radiator. These he first models in wax or clay and then casts in bronze.

Two Clairemonte originals are shown at right: his charging lion for the Inskip line of imported cars; and the emblem of the Classic Car Club of America. Into that one design he worked features of 17 different classic cars, from Franklin trunk to Wills Ste. Claire flying goose on the radiator.—*George H. Waltz Jr.*

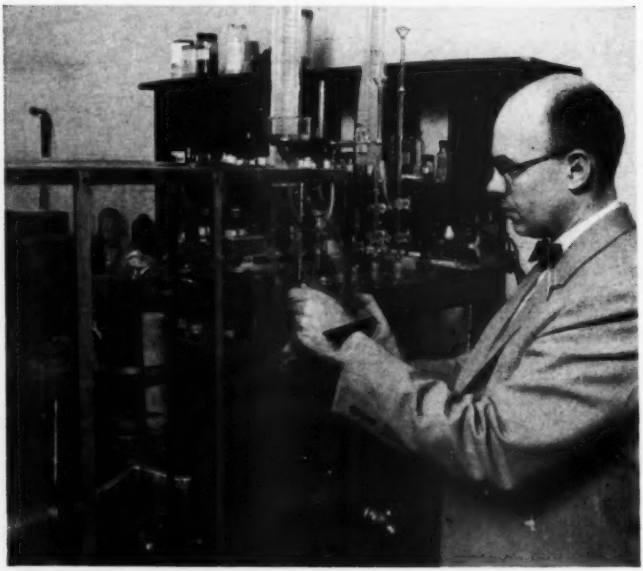


Clairemonte's lion symbolizes British cars.

British Tractor Plows Field Without Driver

A FARMER could hang up his overalls and sit at ease while this tractor moved around the field, plowing expertly. After it has been started by hand, radio controls operate the clutch and engine cutoff, steer the tractor and raise and lower the plow.

Purely experimental, it was built for the British Ford company. The designers point out that the technique has many other possible uses—for instance, taking fire-fighting equipment into the heart of a fire without endangering the life of a driver.



How's the Air? This Electrical Nose Knows

HERE'S an electrical nose that can sniff out tainted air when the contamination is only one part in 20 million.

The work of J. R. Eaton, C. R. Chapman and J. O. Kopplin of Purdue University, it detects odor by measuring the changes in electrical characteristics that contaminations produce on the surfaces of particular test materials.

Forward "eyebrow" slats and big flaps give the Helioplane extra lift for low-speed flying.

Flying the World's Slowest Airplane

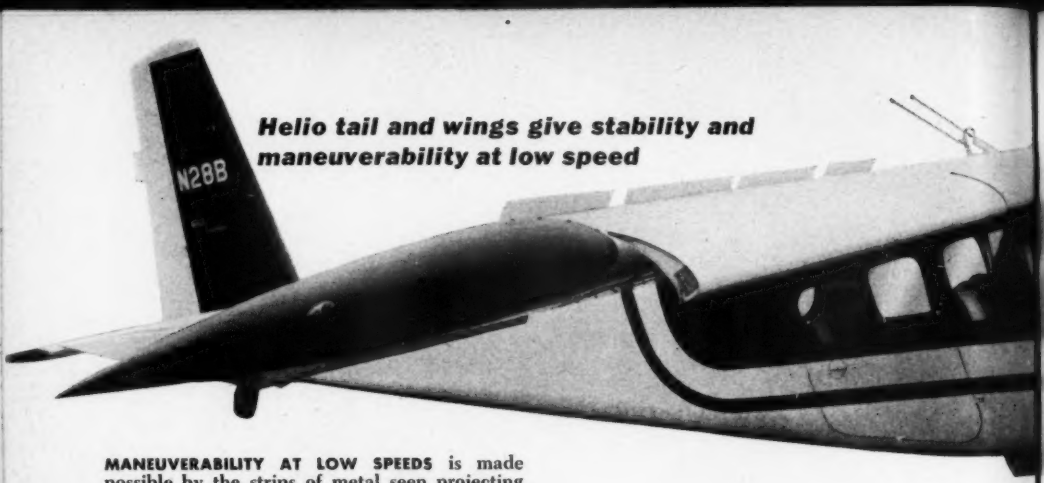
You can drop below the weather and still maneuver safely, for a lazy 30-m.p.h. hedgehop home.

By Herbert O. Johansen

WE WERE flying 150 miles an hour at 6,000 feet in a single-engine lightplane. I was telling my companion at the controls how fast I had flown in a B-57 twin-jet bomber.

"That's pretty fast," he said. "But

SHORT TAKE-OFF and steep climb of the Courier obviate need for a long field or a fast run. The car here started even with the plane and is actually traveling faster at this point.



Helio tail and wings give stability and maneuverability at low speed

MANEUVERABILITY AT LOW SPEEDS is made possible by the strips of metal seen projecting behind the leading-edge eyebrow slats. They block the air flow through the slat and immediately reduce the lift of the wing. This results in dropping that wing, giving the same effect that an aileron would at high speed. These interceptors are operated by the aileron controls. By themselves, ailerons give an opposite effect when used at low flying speeds.

now tell me—how *slow* have you flown?"

"How slow? I don't know. Guess I never gave that much thought."

"You should. In a lightplane it might mean your life," said Dudley V. Talcott, sportsman-pilot of Farmington, Conn., and owner of the first production model of the Helio Courier in which he was giving me a ride.

We had been slowing down gradually. As the indicator needle slumped to 50 m.p.h., Talcott told me to watch the leading edge of the wings. I did. There was a sharp bang, and I saw two curved slats pop out on each wing.

"Those are the 'eyebrow' slats," he explained. "They are popped out automatically by aerodynamic pressure at low speeds."

The needle had gone below 40 and was nudging 35 m.p.h.

"We're going to stall," I said. In fact, by all my past experience in planes, we should have stalled many miles-an-hour back.

"Not in the Helio," said Talcott comfortingly. "The leading-edge slats smooth out the air flow so that I can keep the nose up. And those big flaps I've got all the way down are doubling the lift of the wings."

We went poking along, straight and level. Cars on a highway below were running away from us.

"Now that you've seen stability and low speed, let's try some maneuvering."

What I wanted right then was a parachute. You're not supposed to have that kind of control in a plane just crawling through the air.

In the Helio you have. Talcott lifted the left wing and we went over in a steep bank and into a tight turn. Speed was below 35 m.p.h.

"***No stall, no spin***—safe and smooth as a sea gull," my companion noted as we leveled out again and headed back for

Big prop on small plane makes Courier a fast climber

OVERSIZE PROPELLER, 101 inches long, makes possible short take-off, fast climb. Landing gear, placed far forward, prevents nose-overs in mud, deep snow or on rough ground.

the small airport. We touched ground gently, leisurely. I could have climbed out and walked off while we were still rolling, before we came to a stop within about four plane lengths.

In the airport coffee shack we discussed some of the features of the Courier with Dr. Lynn L. Bollinger, president of Helio Aircraft Corp., Norwood, Mass. He told me that Dr. Otto C. Koppen, Professor of Aircraft Design at Massachusetts Institute of Technology, was responsible for its basic design engineering. That the plane does not need speed to stay in the air is the result of a combination of devices, the most important of which are shown in the accompanying photographs.

"Why does anybody want to fly so slowly?" I asked Dr. Bollinger.

"***For safety,*** especially in bad weather," he explained. "Because you can fly slow, you can fly low—under the weather. In an emergency, you have time to look around for any level spot to land. In case any obstacle, such as a mountain or TV tower should suddenly loom ahead, you can turn on a dime and go the other way. And if you do have to come down, the Helio has a rate of descent less than that of a parachute. You can put it down almost any place that has a few hundred feet of clearance."

Physically, the Helio Courier looks much like any other sturdy lightplane. A four-place job, it is powered by a 260-horsepower geared Lycoming engine. It is 30 feet long, has a 39-foot wing span, and has a range of more than 600 miles with 60 gallons of gas. The price is $24,500.

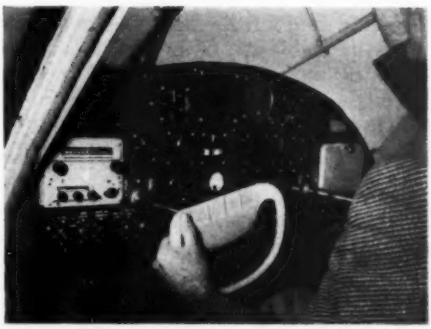
The fact that it can take off and land in short distances, making any yard, golf course or meadow an airport, is secondary, said Dr. Bollinger. Safety and ease of handling in the air at low speeds, by even inexperienced pilots, is the primary consideration.

"Just what was our take-off distance this morning?" I asked Mr. Talcott.

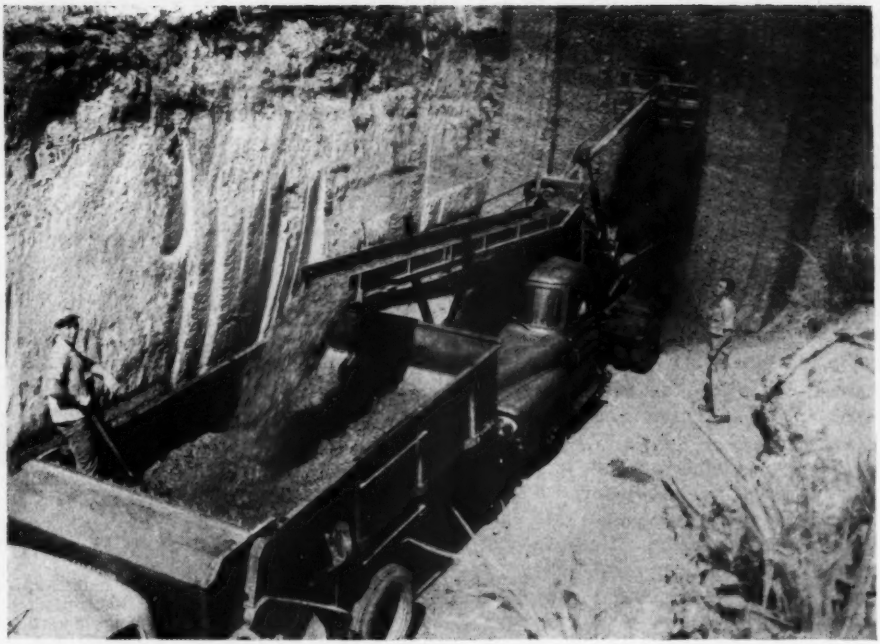
"Oh, about 200 feet. In fact, a football field would make a fine airport for the Helio." END

Tail stability, cabin strength, seat safety

TAIL ASSEMBLY is big. The vertical stabilizer, rising more than 8½ feet above the ground, prevents rear-end sway when the airplane is flying slowly. Length of the plane: 30 feet.



STEEL TUBING (above) over the windshield is part of the Courier's extra-strong cabin structure. The quick-release seat harness (below) is the new Griswold type, which straps across the waist and over the shoulder. It will keep the pilot's and the passengers' heads from being thrown forward in the event of a crash.

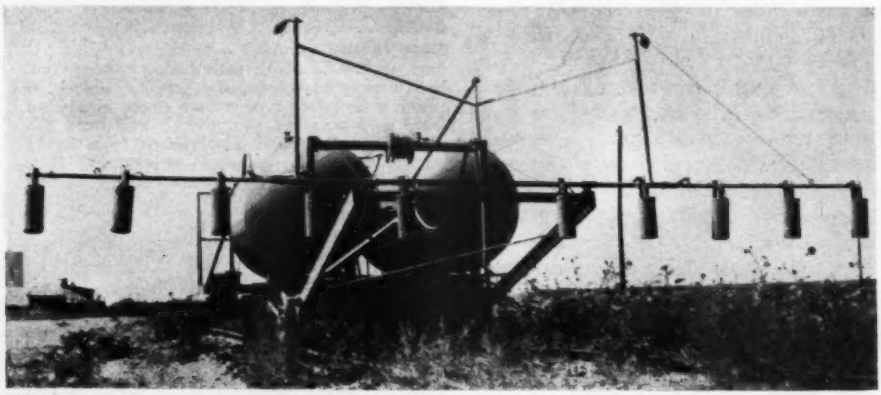


Mechanized Loader Replaces Fork, Moves Fodder Faster

DIGGING and loading are one operation with this new farm machine designed to move silage. Making clean cuts in the face of trenched stock feed, it loads fodder over a conveyor belt at 2,000 pounds a minute. Oswalt Industries, Garden City, Kan., makes it; a power take-off from a truck runs the belt.

Flame Thrower Clears Weeds from Railroad Right-of-Way

THE weird contraption below will ride the Santa Fe's rails, cutting a weed-killing, 16-foot fiery swath. In winter, its 10 tongues of flame, six to 12 feet long, will de-ice car retarders and switches. The heat burns soft ties which should be replaced, and draws creosote to the surface of good ones, preserving them.



Local traffic in Hobart, Okla., has room for leisurely maneuvers on its wide-open streets.

This Town Has Never Had a Traffic Death

By Gilbert Hill

THERE is a town in Oklahoma that hasn't had a traffic death in its 55-year existence, which corresponds approximately with the existence of the automobile. It's the only community in the United States with a population of more than 5,000 that can make that claim. How Hobart has managed the miracle against a dismal backdrop of ever-increasing fatal automobile accidents everywhere else is a lesson in everyday alertness and care.

Hobart folk help out by telephoning the police department several times a day. "There's a speeder," they say, "and the license number is—" Or a citizen will report a driver who seems to be drunk, or one driving carelessly.

Yet arrests for traffic violations average only four a week. The controls on driving aren't imposed by handing out tickets. A cop simply makes a call on the offender and talks things over.

"We're not interested in arrests," says Doss Kutch, the chief of police. "We just don't want anyone killed."

Kutch would have a tough time policing motorists if he didn't get citizen cooperation. His entire force, including himself, numbers only five men.

An unusual ordinance helps, too. Chief Kutch can correct any traffic hazard on the spot. He can put up a stop sign on his own authority. He can order a property owner to remove or cut back shrubs. He can make a businessman pull down a sign obstructing a motorist's view.

Chief Kutch spends hours on safety education. He talks with school children and to parent-teachers and other groups. If there is a child in Hobart who doesn't know that a car's stopping distance shoots up as the square of its speed, he hasn't been listening.

Precaution is constant. Finis Gillespie, city attorney, heads a Kiwanis Club committee which pays school janitors for special traffic duties and teams up with the Rotary Club and the city to buy uniforms, whistles and badges for these extra-duty "policemen."

Hobart's street layout also contributes to its safety record. The community got its first traffic break in 1901, when hordes of land-hungry settlers poured in to draw lots for tracts of land that

'It' Builds 2½ Engines A Minute

Men feed in the metal and push buttons in the world's newest and biggest auto engine plant.

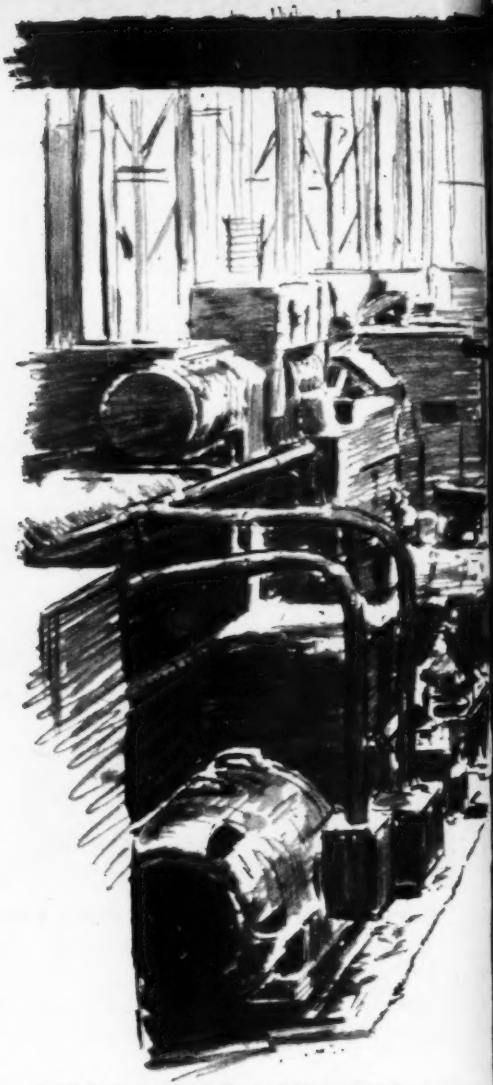
By J. George Janes
DRAWINGS BY THE AUTHOR

THERE'S a place in Detroit where a workman puts a big hunk of metal in a machine, and practically by the time he has scratched his chin and yawned, the hunk of metal has been bored, drilled and burnished to become the shell of an automobile engine.

Nearby, another fellow shoves another hunk of metal into another machine, and it emerges as a cylinder head. Still another feeds in metal to get crankshafts.

The machines do the rest, automatically. Parts keep popping out like doughnuts—at a rate of 2½ engines a minute.

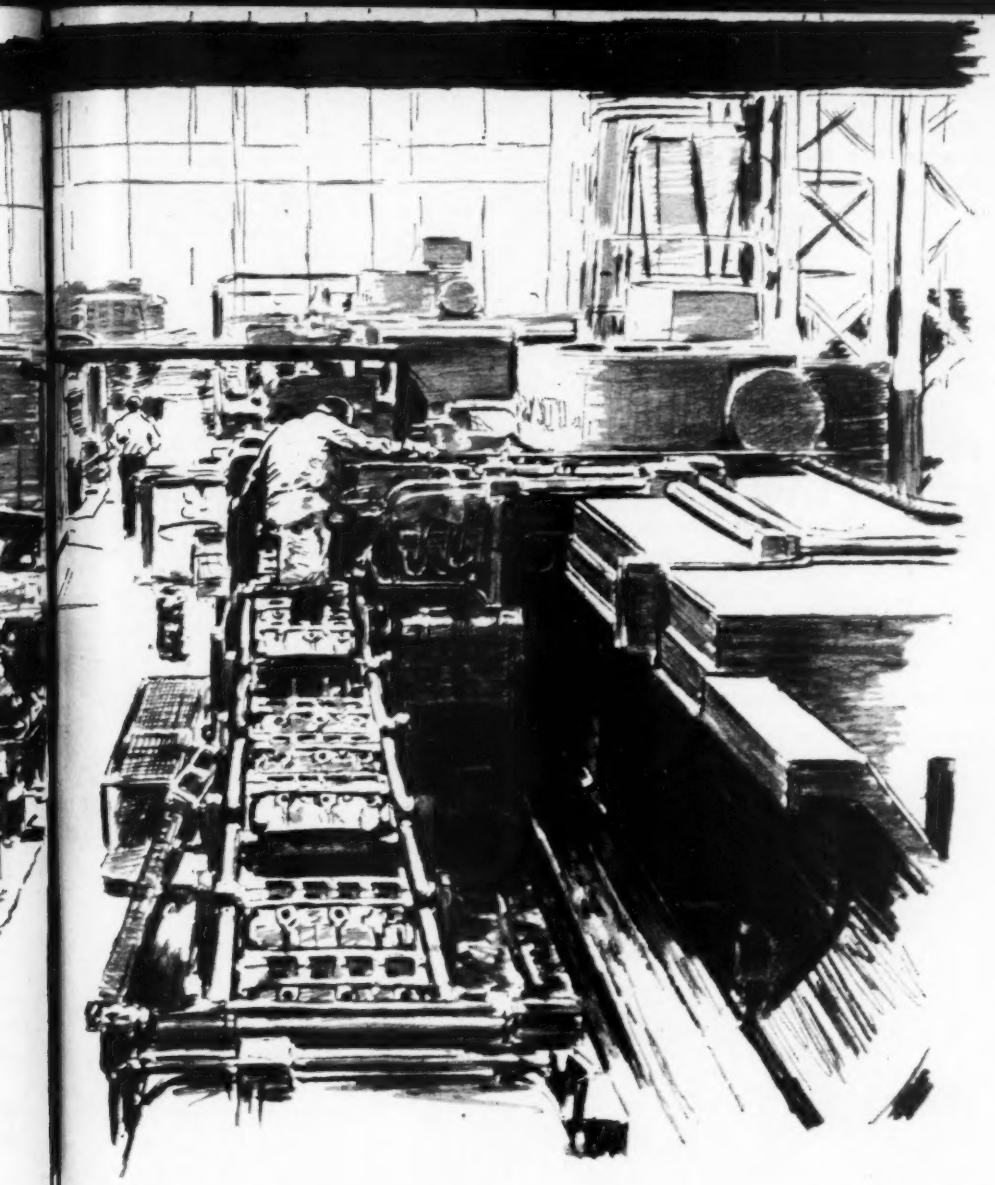
The process is a mite unnerving. The



Only a sprinkling of workmen tend robots of automation

MACHINES DWARF MEN. Broacher is like a giant file, planing a V-8 Plymouth engine in one stroke. Chap in middle distance, a representative of a machine-tool company, is making final adjustments on a huge broaching tool. Among other things, a broacher is used for drilling holes that aren't round. Engine production was largely a manual operation until after World War II. Then Ford went to automation. Olds, DeSoto, Pontiac and others followed. System makes mass production of engines possible.

CONTROL PANELS govern the operations. Two of many used are shown here. The man at the push-button console remote-controls several tools that machine engine blocks.

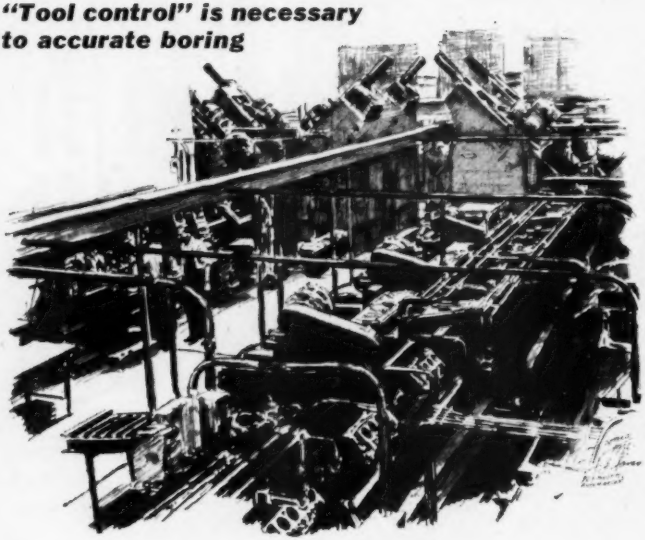


machines have a surgeon's touch, but a brute's strength. They almost think.

The hunks of metal are castings, rough pieces of congealed iron or steel. The machines finger them delicately, plane them, polish them and bore holes in them. If a machine makes a mistake—which is rare—it rejects its own work. When the machines have finished, a man steps in again to use his hand skills. He completes the assembly of parts to fashion engines for the open road.

Pictured on these five pages is the automatic engine factory of the Plymouth Division of the Chrysler Corporation. It's the newest and biggest anywhere—an operation in automation that has cut the plant's direct labor force, yet increased the skilled maintenance workers among its 3,000 personnel.

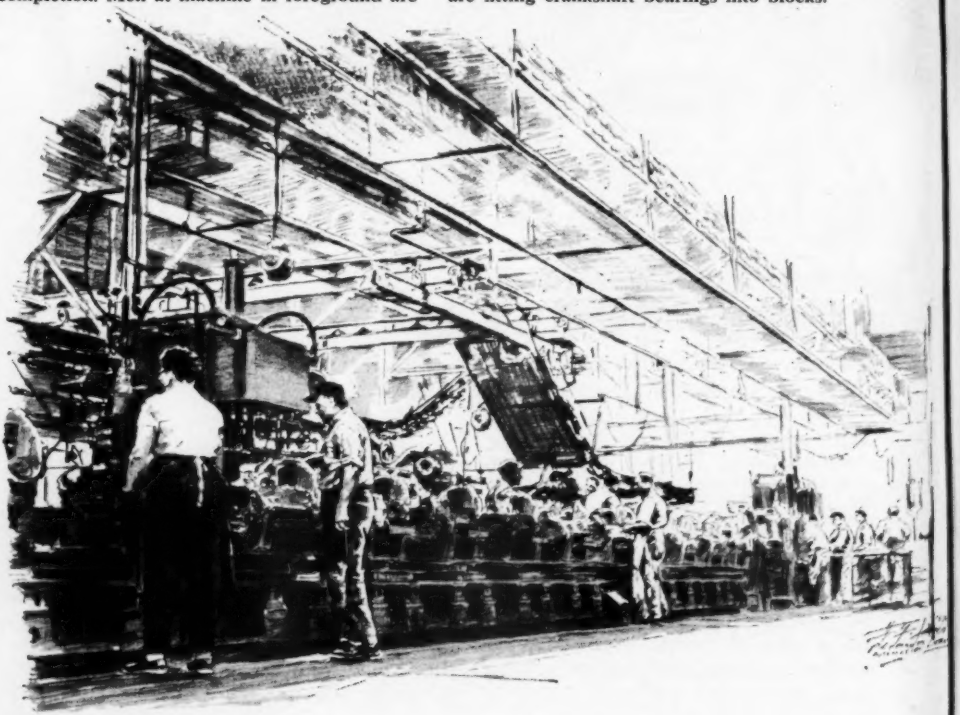
"Tool control" is necessary to accurate boring

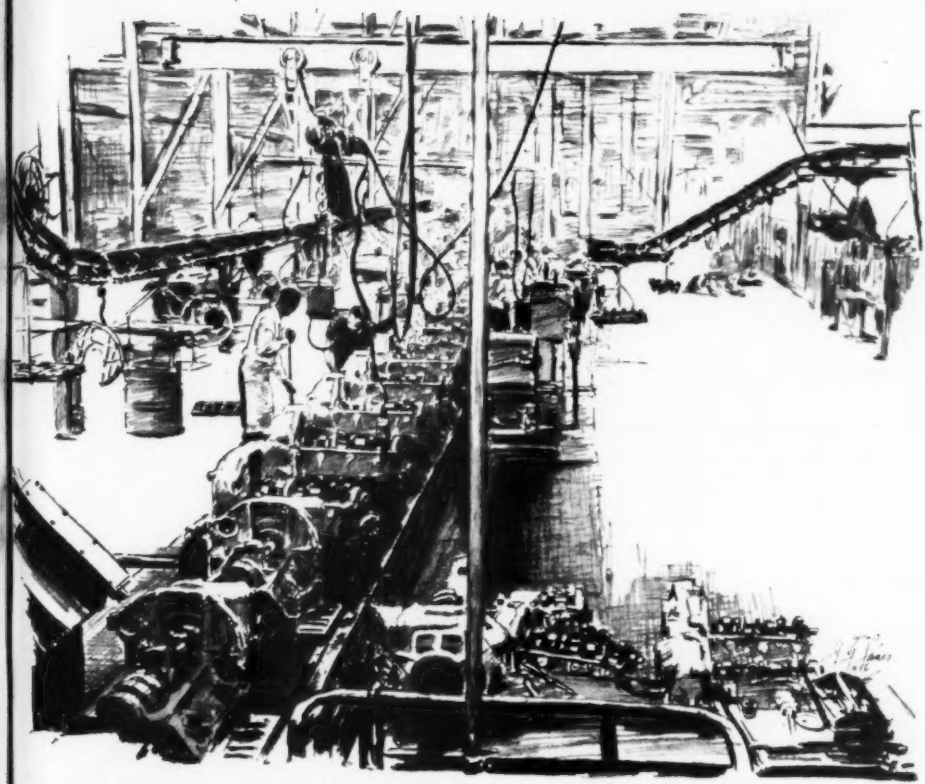


DRILLS GET DULL. So do the other tools used in the machines. Replacement must be made at proper time, and machines signal when that time comes. Workmen in the picture at left stand before a "tool-control board," which keeps a running record of which machine needs what. In foreground, automatic machines are performing a score of operations on engine blocks and other components. Blocks are moving through point called a "transfer station." In background are the impressive machines that rough-bore the cylinder holes.

Final assembly requires the dexterity of human fingers

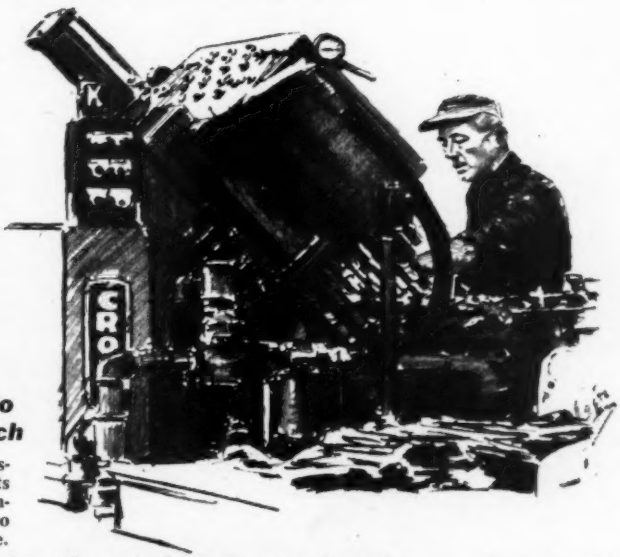
NUMBER OF PEOPLE multiplies as engines near completion. Men at machine in foreground are working on bearing assembly; those in distance are fitting crankshaft bearings into blocks.





Overhead conveyors feed in parts to complete the engines

CONTINUOUS STREAM of components, like tributaries to a river, flow in as engines near end of assembly line. Conveyors at left and right are delivering transmission housings and miscellaneous assembled parts. Men in center of picture are attaching water pumps to engine blocks. In foreground is engine transfer point where blocks, which have been moving sideways, are repositioned for final crankshaft adjustments.



Nut runners outdo the monkey wrench

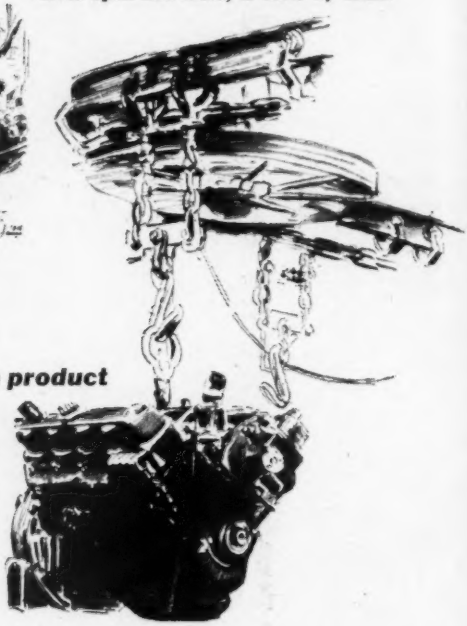
MULTIPLE TOOL takes guesswork out of tightening nuts on cylinder heads. It imparts exactly right twist to all nuts at the same time.

Please turn the page for more on automation

Finally, valves are adjusted

TAPPET SETTING, to prevent that "click" as valves open and close, is done by hand.

"Bobtailed" engine is the product



HOOKED TO CONVEYOR, engine goes to quality-control station for examination. For convenience in shipping and storage, it is without such accessories as transmission, carburetor, generator, starter and fuel pump. If it passes muster, it will get aluminum spray job in the paint shop.

Engines are ticketed for test

IN "HOT TEST" AREA, each engine is tagged with what is called a seven-way ticket. Here it receives a 20-minute test run. If it's okay, inspector tears off one stub of the ticket. At various stages on its way to installation in a car, the engine loses the remainder of its stubs. END

Taking the Pain Out of Paying Parking Fines

Nº 1
Date Time
License
Meter
Officer
SORRY, You Have Overparked
The charge for this overtime is 25c if paid within 48 hours. If not paid within 48 hours, the charge is $1.00.
You may pay this by placing 25c in this envelope and depositing it in any of the yellow Traf-O-Teria Courtesy Boxes located on or near meter posts, or at the Police Station, or mail to Police Department.
NOTE
A charge of 50c is made for each additional hour of overtime parking at same meter.
A failure to remit will result in issuance of summons and added penalty, as provided by ordinance.
JUNCTION CITY POLICE DEPT.
JUNCTION CITY, KANSAS
Copyright 1953 by TRAF-O-TERIA SYSTEM El Dorado, Kansas
Patents Applied For

DO-IT-YOURSELF SYSTEM now collects fines for overparking. When a cop notices that a motorist has parked too long, he slips an envelope bearing a courteous notice (center) under the windshield wiper. The parker, upon returning, puts the money inside and drops the envelope (left) into a box attached to the meter post, from which it is later collected (right).

THE police in more than 300 U.S. cities are back on speaking terms with motorists who overpark. Both sides have Harley McMillen to thank.

McMillen is city manager of El Dorado, Kan. One bitter winter night in 1951 he found himself in trouble. A passel of angry citizens had met to demand the removal of parking meters from the streets. They didn't mind the meters. They did mind being haled into court to pay fines for overparking.

McMillen did something about it. He thought of a new way of collecting penalties. Appropriately, it's called the Traf-O-Teria System.

The system consists of a violation notice printed on an envelope, a duplicate, and "courtesy boxes" attached to meter posts—at least one box to a block.

When a motorist finds one of the little envelopes tucked under his windshield wiper, he slips the amount of his fine (it's small) in the envelope, drops it in the courtesy box and pockets the duplicate, his receipt.

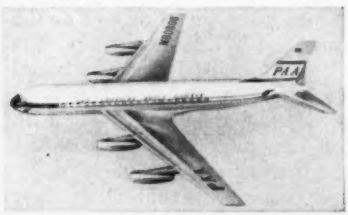
The system takes the sting out of the overparking fine. The message on the violation notice helps, too. The word "fine" appears nowhere.

The success of the Traf-O-Teria in El Dorado deluged McMillen with requests by other cities for blueprints.

City coffers have benefited all over the country. The experience of Tupelo, Miss., is typical. Though the fine for overparking was dropped from $1 to 25 cents, the city collects more money through the courtesy boxes than it levied in fines for the offense in traffic court.

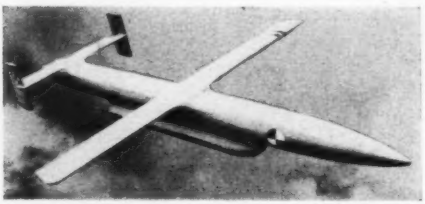
New in Aviation

Flying Crane The copter above is toting a four-ton trailer van between its stiltlike legs. The experimental Hughes XH-17, developed for the Air Force, may lead to huge helicopters that can haul loads of more than 10 tons or 75 combat-equipped troops. Power is from two turbine engines that supply gas pressure to burners on the rotor tips. The rotor blades span 130 feet.

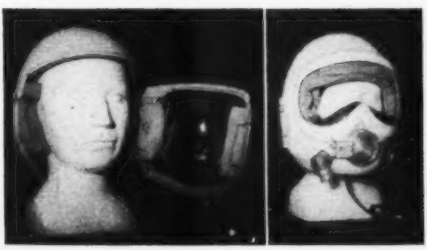


Jet Cabin This model was built by United Air Lines while it was preparing to order 30 Douglas DC-8 airliners (sketch at left). Interior of the full-size, 95-foot-long wooden fuselage was fitted with different seating arrangements, buffet, and various window sizes. The DC-8 jets are scheduled to go into commercial service on several U. S. airlines during 1959.

Big Bubble Windows amidships enable scanners in the SC-54, new Air Force rescue version of the Skymaster, to look down while searching for survivors. The crew includes paratroopers trained in rescue work.

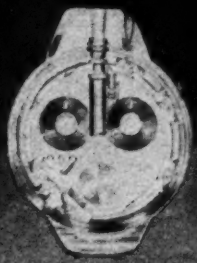


Target A pulse jet powers Holland's first pilotless airplane, designed as a gunnery target and for radar training. Flight of the AT-21 is electronically controlled. Parachute recovery is provided for the all-plastic craft.

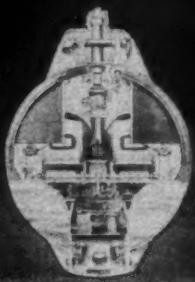


Blastproof This helmet won't blast away in bailouts by supersonic jet pilots. It's a complete head covering, with oxygen mask and communications set. Faceplate, shown removed at left, hinges from either side.

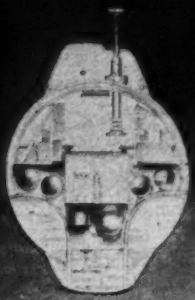
20 Miles Up That's the destination of a man-carrying, pressurized, eight-foot gondola that the Air Force is planning to send aloft soon to study the physical effects of high-altitude on man. Jumping the gun on the Air Force is a simulated-ascension sequence in a new 20th Century-Fox movie, "On the Threshold of Space," from which the above still photograph was taken.



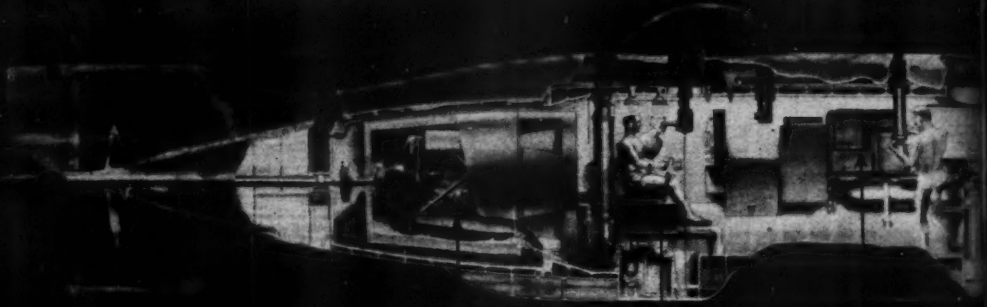
Engine-room bulkhead has inspection windows and access door.



Dual, airplane-like control system is shown in this view.



Looking forward are oxygen tanks, periscope, communications racks.

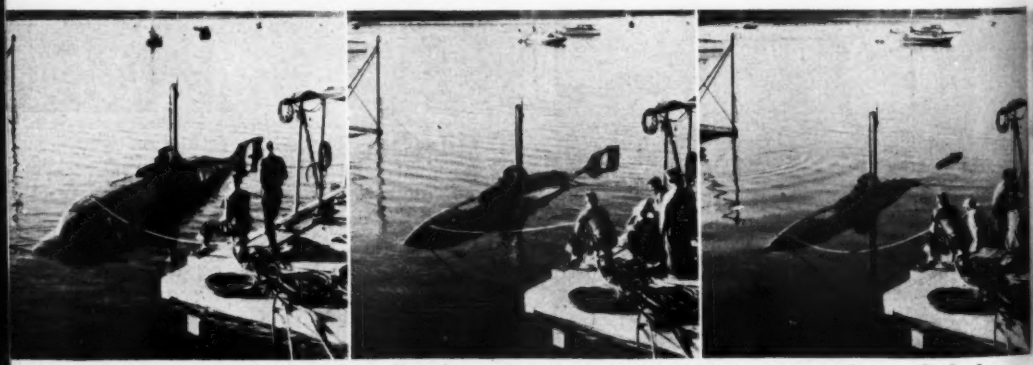


ENGINE ROOM

DUAL-CONTROL POSITION

UNDERWATER SOUNDING EQUIPMENT

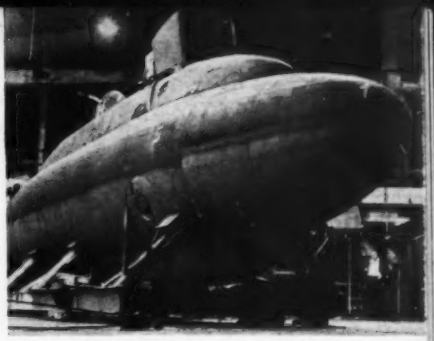
QUARTERS ARE CRAMPED for the four-man crew of the X-1, but the designers have squeezed in a maximum of comfort features: bunks, reading table, soft lighting, air conditioning and temperature control, dime-size walkway for exercise, food and water storage, and a hot plate for preparation of warm meals. The separated power plant is insulated to cut down the noise level in the cabin. The dual-control system permits one-man operation of the submarine.



Dunking tests in shallow water, which preceded the midget sub's deep-water trials, are clocked

Swimmer's tank and exit-entry hatch are located forward.

SWIMMER'S EXIT-ENTRY HATCH



BABY SUBMARINE—the USS X-1—was born in an aircraft hangar at Farmingdale, N. Y., of the Fairchild Engine Division, whose engineers designed and built it. The Navy's first midget underwater craft, it weighs 25 tons, is 50 feet long and seven feet in diameter.

Four Men Run Half-Pint Sub

ALTHOUGH one of the first missions of the U.S. Navy's first vest-pocket submarine (X-1) probably will be to test our own harbor defenses, in time of war this role would be reversed.

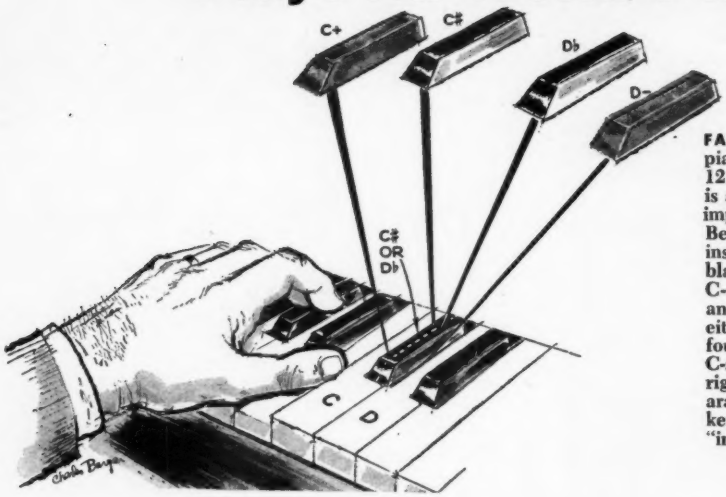
Silent as underwater shadows, baby submersibles like this could penetrate enemy harbors. Once inside, they could launch missiles with atomic warheads, wreak havoc among shipping, reconnoiter defenses, or send ashore frogmen commandos.

Long range would not be necessary since these tiny pig boats could be launched from aircraft carriers. With the fleet they could serve as a perimeter defense for a surface task force and as enemy-sub killers.

NO WHALE THIS, but the X-1 shrouded for land hauling. Disassembled, the vest-pocket sub can be air-transported.

from the dock by engineers.

Organ's 31-Note Scale Plays All World's Music



FAMILIAR SCALE of piano or organ, with 12 keys to an octave, is a long-accepted but imperfect compromise. Between C and D, for instance, is a single black key doubling for C-sharp and D-flat and not quite right for either; new scale has four notes as shown. C-sharp and D-flat get rightful pitch as separate black keys. Blue keys play added notes "in the cracks."

Science provides a "perfect" keyboard to impart new beauty to music, classical or modern.

UPON a pipe organ just completed in the Netherlands can be played the music of every civilization of past, present and future.

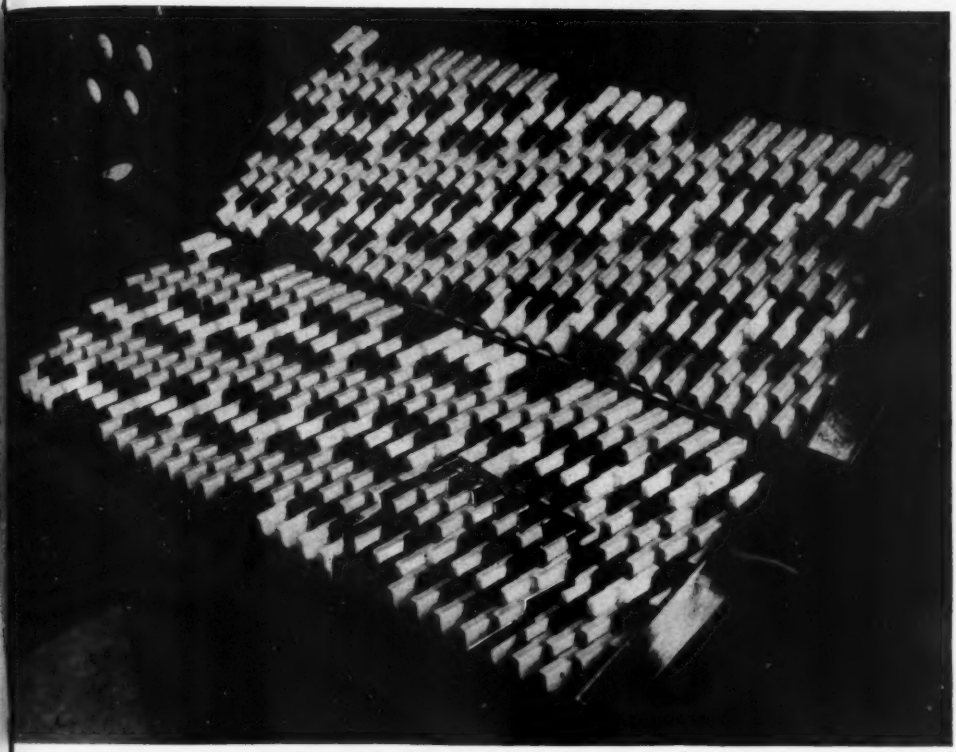
Its universal scale fulfills musicians' dreams of a playable keyboard with 31 notes to the octave—theoretically the ideal number—instead of the 12 of the familiar chromatic scale. First public recitals, in the Teylers Museum at Haarlem, show what exciting things this makes possible:

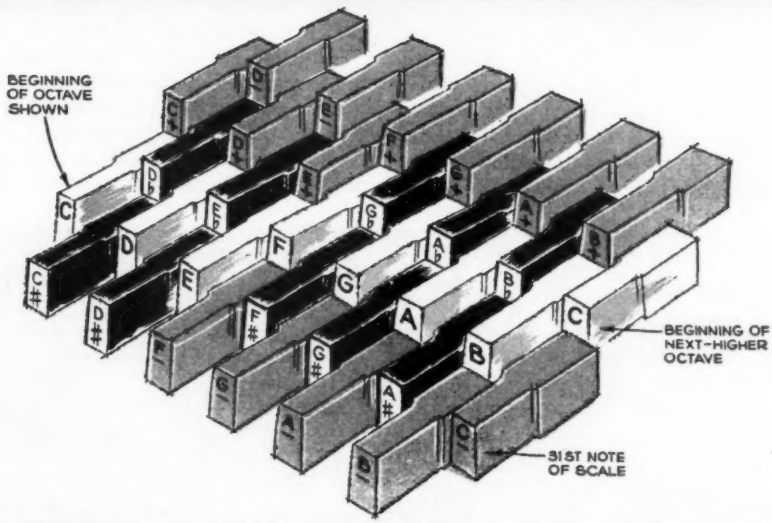
To the classical works of European composers, the organ imparts new beauty, by its supremely "hi-fi" rendition of chords that a conventional keyboard only approximates. With equal facility the organ plays the exotic harmonies of music from such faraway lands as Arabia and Java. It captures the music of songbirds that no other keyboard can imitate. And imaginative composers have begun writing out-of-this-world music with harmonies never heard before, especially for the keyboard of the new organ.

White, black and blue keys, arranged in tiers on its keyboard, divide an octave scientifically into 31 equal intervals—each representing one-fifth of a tone.

While the new keyboard looks complicated at first glance, many of its hundreds of keys are duplicates for convenient fingering, and their ingenious and logical arrangement simplifies learning to play the organ. Alternatively, a performer of classical music may use an auxiliary console with a conventional keyboard, interconnected by electrical switching with special sections of the complete scale.

The mathematical and musical perfection of the 31-tone scale was discovered as early as the 17th century by the famous Dutch scientist and musician, Christian Huygens, but it has remained until now for scientific advances to create an instrument capable of playing it. The organ's pipes must be tuned so precisely that a pattern on an oscillograph screen, rather than the human ear, tells when the tone adjustment is perfectly accurate.—*Alden P. Armagnac.*





NEW ORGAN arranges keys, top, as in diagram of one-octave portion. White keys play do-re-mi; black keys, true-pitched sharps and flats; blue keys, new "half-sharps" (+) and "half-flats" (−). On this keyboard can be played any music ever composed—familiar classics, or Oriental music with harmonies novel to Western ears. (Photo from *Scientific Monthly*)

New Wagons Haul More—in Higher

By Devon Francis

STATION wagons this year are looking more like sedans outside and buses inside. They're getting the sweeping, curving lines of conventional passenger cars. And they tote more people. The manufacturers are turning out more of the three-seater jobs that accommodate eight or nine persons.

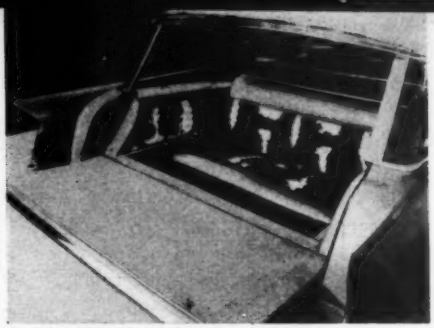
This reflects, for one thing, the increased use of wagons by suburban housewives in hauling their own and neighborhood kids to school.

One company found that it had pulled a blooper in abandoning its eight-passenger wagon last year. So now it's building a nine-passenger job. Another, for the first time, is offering a three-seat car that will also tote nine.

Rambler wagon has a hardtop look

LOOK, NO TRANSOM: Rambler's rear window can be cranked down into the tailgate, which then works just like any other station-wagon gate. The cargo door on '56 models is a full foot wider than last year's job; cargo space is up 20 cubic feet. Folks must like them: The company says that half its Rambler production last year went into Cross Country wagons.

Chrysler's dream station wagon sets a new peak in plush



WEATHERPROOF FABRIC covers two-thirds of the Plainsman's steel top. Upholstery is calf hide. The rear seat faces backward.

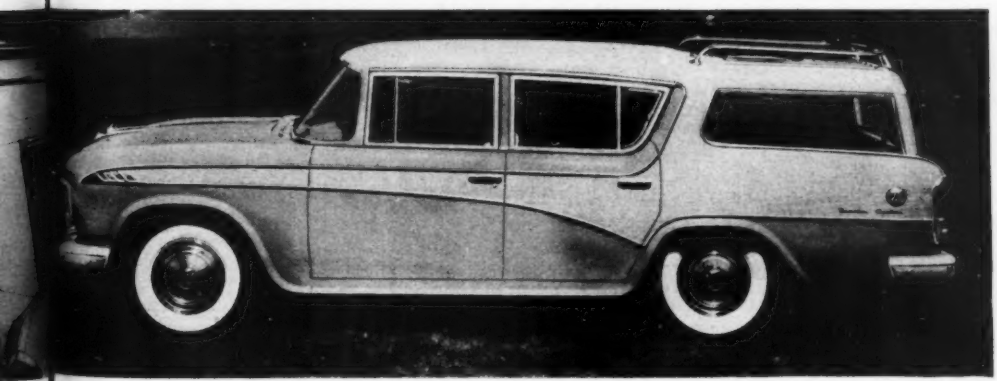
HINGED PANEL on rear fender hides the vertically mounted spare tire. Electric motors operate the tailgate, rear window and third seat.

Style

The split seat, expanding the capacity of the second bench from two to three passengers, is becoming more popular.

In all, 42 models of station wagons are in the showrooms. That's how many versions a dozen manufacturers are turning out—12 more than last year. They're more stylish than ever. They're dreamier.

But the dreamiest of all—the forty-third—is one that's beyond price. It's



CARPETED DODGE can double as an ambulance in an emergency. This wagon is sprung to accommodate a half-ton of cargo. Transoms are counterbalanced. Like Buick (right), Dodge wagon has a split middle seat for easier access.

FOLDED FLUSH, Buick's split seat can be used to support a lengthy piece of cargo and still ride a couple of passengers. Buick is the only manufacturer to cut prices on its wagons—up to $226. It will triple wagon production.

CHILDREN'S SEAT in rear of DeSoto Firedome is easily removable if space is needed for cargo. The seat is 40.5 inches wide, 12 deep, and 6.7 inches off the floor. It provides 28 inches of headroom. The trim is vinyl plastic.

Chrysler's Plainsman, and there's only one of it—it's strictly a show job.

Like the current crop of sedans, hardtops, coupes and convertibles, the new wagons have more horses up front. Most seats are wider. Upholstery is fancier.

But, compared with last year, scissoring has been done on some of the cargo-loading doors. In other cases, the distance between roof and cargo bed has been chopped.

All this improves the appearance, no doubt, but it won't make a home workshopper—with a four-by-eight plywood sheet to haul—any happier.

Among other changes by individual companies, Studebaker has three complete new lines, and Mercury has added a new six-passenger wagon.

Prices, generally, are up. But price didn't stop the customers in '55. With final returns still to come in, it looks as though 700,000 wagons were sold—some 300,000 beyond predictions a year ago.

TAKING OUT CHEVROLET'S THIRD SEAT is an easy job from inside or out. First, hinged braces that fit into seat backs are released (left). The seat back is folded flush. The cushion, which is held to the floor by flanges and slots, is then lifted free (center) and removed (right).

Dimensions of '56 Station Wagons

	PASSENGER SPECIFICATIONS							CARGO-COMPARTMENT SPECIFICATIONS								BODY SPECIFICATIONS									
		CUSHION WIDTHS (inches)		LEG ROOM (inches)					MAXIMUM DIMENSIONS (inches)				REAR OPENING (inches)												
	PASSENGER CAPACITY	NUMBER OF SEATS	FRONT	MIDDLE	BACK	FRONT	MIDDLE	NUMBER OF DOORS BACK	CUBIC FEET	HEIGHT	WIDTH	LENGTH (tailgate up)	LENGTH (tailgate down)	HEIGHT	WIDTH	TAILGATE LOADING LEVEL (inches)	HEIGHT (inches)	WIDTH (inches)	LENGTH (inches)	CURB WEIGHT (pounds)	DIAMETER OF TURNING CIRCLE (feet)	ROAD CLEARANCE (inches)	TIRE SIZE	MANUFACTURER'S RECOMMENDED PRICE
BUICK SPECIAL ESTATE WAGON	6	2	62.4	–	59.5	35	–	40.8	4	75.3	32.2	56.3	83	104.1	31.4	49.2	30	60.6	76	206.7	4,250	44	6.3	7.60 x 15	$3,081
CHEVROLET[a] BEAUVILLE	9	3	62	62.1	46.4	43.5	42	39	4	87	36.9	58.3	84.4	106.1	28	43.6	30	60.8	74.3	200.8	3,682	42	6.5	6.70 x 15	$2,767[b]
CHRYSLER NEW YORKER	6	2	64	–	64	44.6	–	43.5	4	84.8	36.8	64.5	91	122.6	30.5	50	23.8	62.5	81	220.3	4,720	43.7	6.5	8.00 x 15	$4,811
DE SOTO FIREDOME	6	2	64	–	64	44.6	–	43.5	4	84.8	36.8	64.5	91	122.3	30.5	46.6	23.8	62.2	79.1	218.6	4,400	43.9	6.2	7.60 x 15	$3,651[c]
DODGE[a] SIERRA	8	3	63.5	63	63	44.5	43	43	4	83.1	32.3	63.7	81.5	109.3	31.3	46.6	26	60.5	74.1	214.9	3,725[d]	42.2	5.5	7.10 x 15	$3,087[c]
FORD[a] COUNTRY SEDAN	8	3	60.5	50.2	43.8	44.3	39.8	37.4	4	90	37	60.5	82.9	105.4	32.1	46	24.2	62.2	75.9	197.6	3,782	41.2	7.2	7.10 x 15	$2,797
MERCURY MONTEREY	8	3	55.3	50.2	46	43.8	40.8	37.4	4	90	36.9	60.5	82.4	109	32.1	46	25.8	62.4	76.4	201.9	3,885[d]	43.6	7	7.60 x 15	$3,023[e]
PLYMOUTH[a] CUSTOM 4-DOOR	8	3	63.5	63	46.4	44	43	38.5	4	82.1	37.4	64	78	100.4	33	49.6	21.6	60.4	74.6	209	3,755	40.5	5.8	6.70 x 15	$2,707
PONTIAC 860 SERIES	9	3	61.8	62.1	46.4	43.4	39.6	43	4	74.8	36.4	56.5	89.2	100.6	28.1	42.6	25.4	61	75.1	206	3,801[d]	42.5	6.7	7.60 x 15	$2,956
RAMBLER CROSS COUNTRY	6	2	59.7	–	60.1	43	–	42	4	80	31.2	55	73.5	95.2	24.5	51	27.5	58.5	71.3	193.6	2,868[d]	37.5	6.3	6.40 x 15	$2,633
STUDEBAKER[a] PINEHURST	6	2	59.5	–	56.5	42.5	–	41.5	2	65	37.5	42	72	92	30.4	45	27.5	61.8	71.3	200.7	3,560	39	7.1	6.70 x 15	$2,825
WILLYS[f] F4-134	5	2	56.7	–	44	43.6	–	38.6	2	100	44.5	58.2	68.5	95.7	41	44	20	74	71.7	176.2	3,278	43.9	8.1	7.00 x 15	$2,136

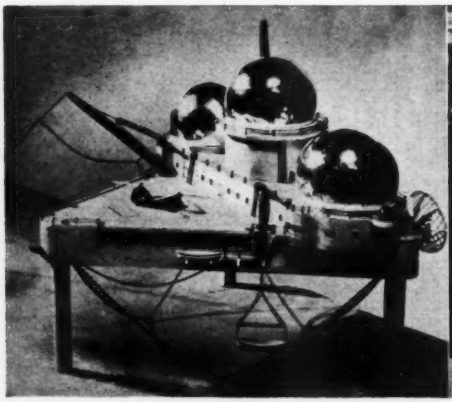
Prices quoted are suggested factory retail prices and include federal excise tax, automatic transmission where offered, radio and heater; but no other taxes, freight or dealer preparation charges unless specified. Chart lists data (supplied by manufacturers) on only one model of each make. Buick, Chevrolet, Dodge, Ford, Mercury, Plymouth, Pontiac and Studebaker offer more than one model—in some cases, several—in various "lines." Chevrolet, Dodge, Ford, Plymouth and Studebaker offer both 6- and 8-cylinder engines; Rambler only a 6, Willys a 4 and a 6; remaining wagons are V-8s. Ford, Chevrolet, Plymouth, Dodge and Pontiac offer 2-door wagons and 2-seat wagons. Mercury, too, has a 2-seater. Chrysler and DeSoto have an optional children's seat.

NOTES: [a]with 8-cyl. engine; [b]without radio; [c]includes distribution and handling charges; [d]shipping weight, does not include gas, oil and water; [e]excise tax extra; [f]manual transmission only, 2-wheel drive (three Willys wagons differ only in horsepower and 2- or 4-wheel drives).

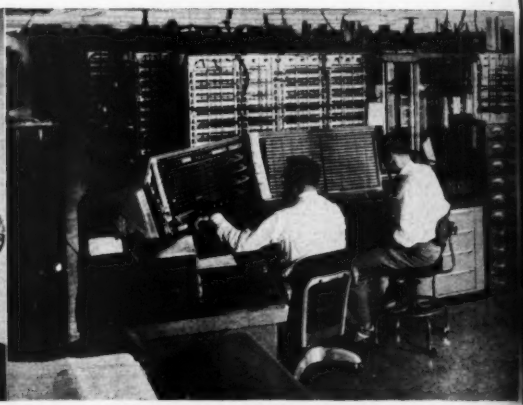
Fighting an Air Battle from

AN ELECTRONIC brain is ready to defend the U.S. against air attack. From the ground, its 25,000 tubes, miles of magnetic tape and more than 300,000 memory cores can identify enemy planes and control the weapons that shoot them down.

The computer, part of the new Sage defense system developed at the Lincoln Laboratory of Massachusetts Institute of Technology, shows on TV-like screens the airplanes flying over its area and identifies them. If one turns out to be hostile, it indicates all defense weapons available—even telling where and how soon a fighter can intercept the attacker



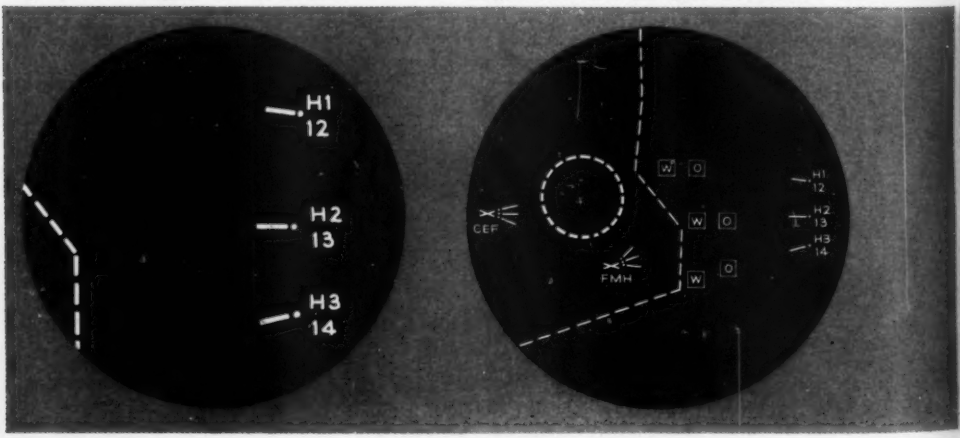
RADARS—on man-made islands, ships, planes and ground—spot aircraft and signal Sage computer. The computer also gets observer reports.



COMPUTER checks each plane report against weather data and flight plans it has memorized. When it can't identify one, it rings a bell.

1 BATTLE ON SCOPE begins when three planes are tagged hostile, assigned track numbers 12, 13, 14. Length of dash indicates each plane's speed, direction of dash indicates heading. Here, scope shows enlarged view of hostiles.

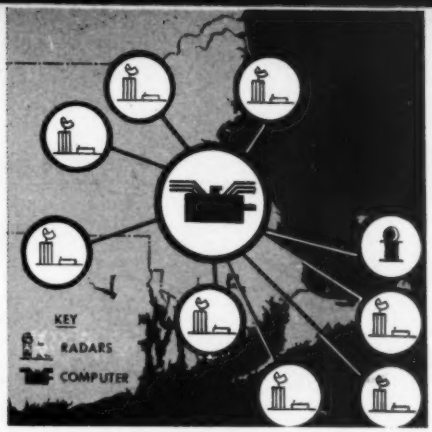
2 BIG PICTURE shows hostiles (right), defense border (dashed line), antiaircraft coverage (circle), Westerly (CEF) and Oberlin (FMH) airfields. Boxes show where Westerly and Oberlin fighters would intercept each hostile.

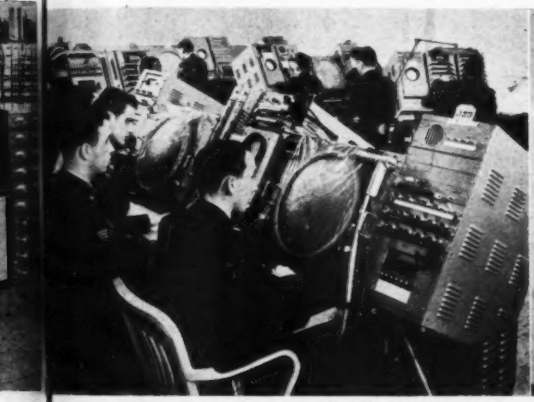


the Ground

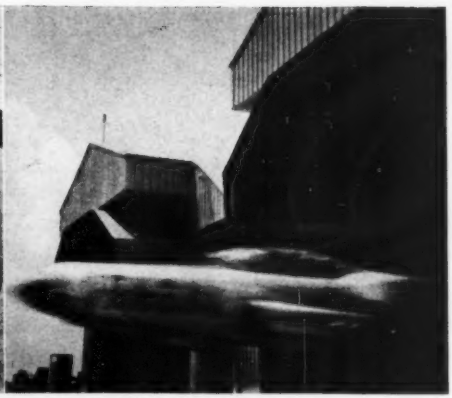
—then actually flies the intercepting planes and missiles to their targets.

To protect the U.S., 32 Direction Centers similar to the test setup in New England (map at right) will be built at a cost of more than a billion dollars. Each center will have two computers—one in use, and one stand-by.—*Martin Mann.*





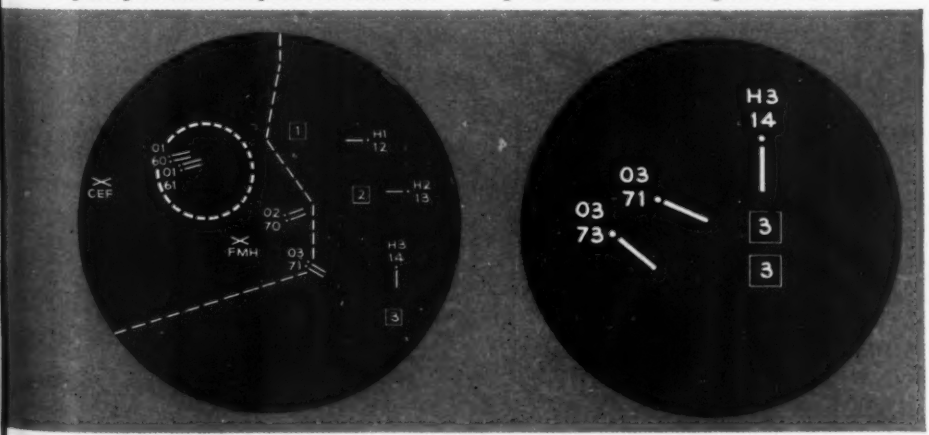
SCOPES show electronic sketch of plane tracks, ground, and defense bases. Officer here decides if an unidentified plane track is "hostile."

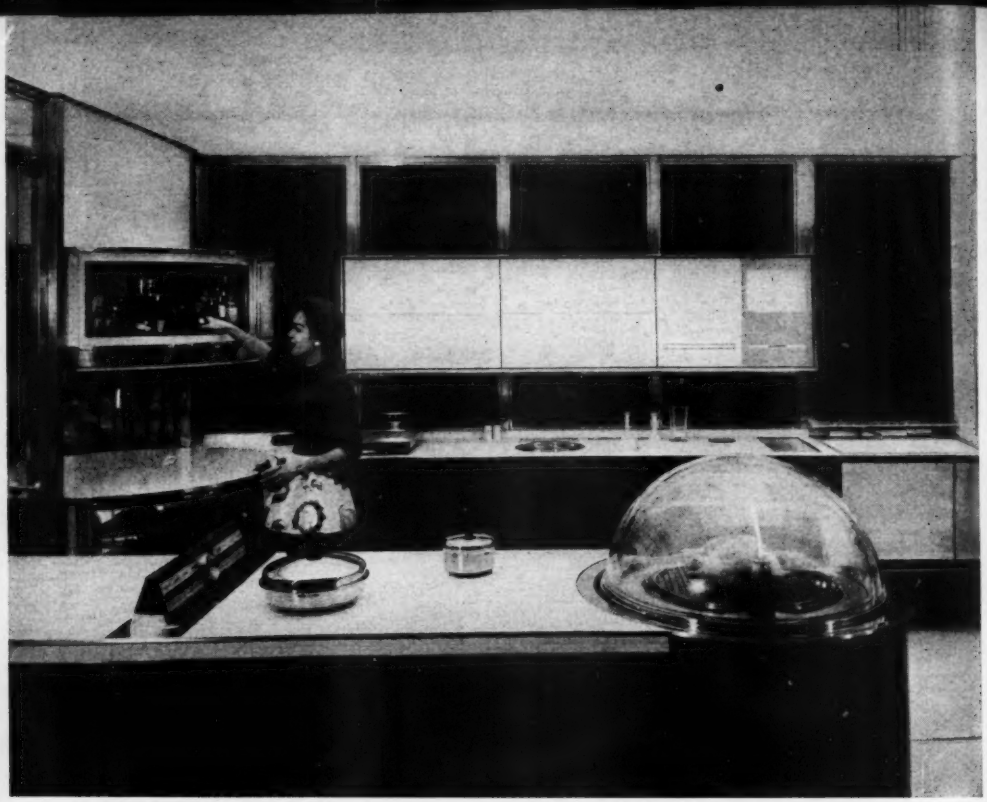


JET, ordered out by officer at scope, takes off under pilot's control. Computer then flies it to target, radioing signals to automatic pilot.

3 **NEW TRACKS** are interceptors. From Westerly, tracks 60, 61 head for hostile 1. From Oberlin, track 70 goes after hostile 2, track 71 after hostile 3. Boxes show corrected interception points that computer has calculated.

4 **THE END FOR HOSTILE 3** comes as two jets of track 71 separate for the kill, introducing another track (73). Computer now figures interception points (boxes) for each. It looks as if plane of track 71 will get there first.





A Kitchen to Dream About and Maybe Get—Tomorrow

A FULL-VIEW, glass-domed rotating oven and a marble-topped range (foreground) that cooks without getting hot are features of Frigidaire's Kitchen of Tomorrow shown at the GM Motorama. The "dream" kitchen also has a revolving refrigerator (left rear), in which deliverymen can put milk and frozen foods from outside. Other appliances include a recipe maker that selects and measures ingredients and a phone device to start dinner when you dial from downtown.

They Say Now...

DR. WARREN WEAVER, ROCKFELLER FOUNDATION: *"The most far-reaching discoveries and . . . useful applications regularly flow out of ideas which initially seem abstract . . . Impracticality is more generally important than we are inclined to suppose."*

JAY DOBLIN, ILLINOIS INSTITUTE OF TECHNOLOGY: *"People spend one-third of their lives in bed. It's time [the bed] was improved."*

MORRIS D. HOOVEN, PRESIDENT, AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS: *"A queer combination of confidence and uneasiness confronts the scientist and engineer of today: confidence in his ability to control the physical world; uneasiness concerning the end to which he is leading civilization."*

DR. JAMES R. KILLIAN JR., PRESIDENT, MASSACHUSETTS INSTITUTE OF TECHNOLOGY: *"At a time when we are forced to match wits on every front with an alert enemy of growing prowess, America's survival requires that the American people attach a higher value to the hard labor of rigorous thought."*

DR. WILLARD F. LIBBY, COMMISSIONER, ATOMIC ENERGY COMMISSION: *"We could afford to double our present educational expenditure if it would give us one more Fermi per generation."*

Conveyor Belt to Speed Army Cargo 10 Miles from Docks

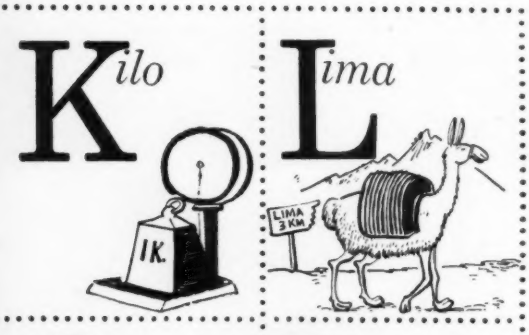
MOVING cargo one to 10 miles inland at the rate of 270 tons an hour, and on grades up to 27 percent, a new U.S. Army Transportation Corps conveyor system is expected to clear ports faster and with less manpower than trucks. A section of the proposed system is shown being tested above at Fort Eustis, Va.

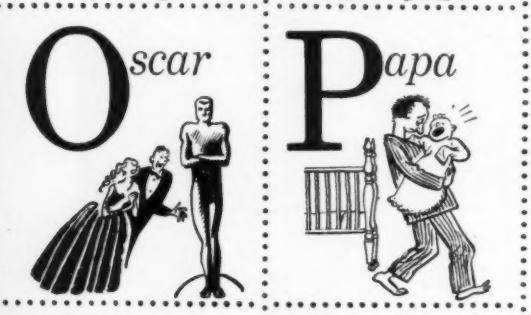
Rolling Radio Station Guides Tour

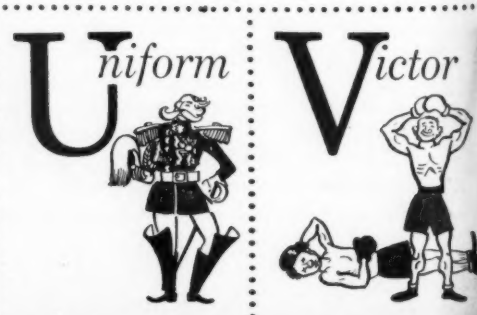
BROADCAST over a headset mike and a transmitter on wheels, the voice of a factory guide (pointing) is carried clearly to visitors as far as 40 feet away despite the noise in the plant.

The system was used during a recent press tour of the Hughes Aircraft plant in Culver City, Calif. Each reporter was equipped with a pocket transistor receiver and hearing-aid type earphone. A cart (right) carried the transmitter and extra receivers.

Airmen Are Learning



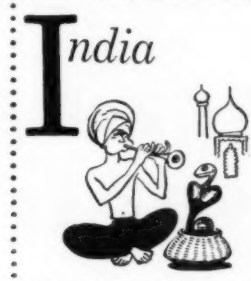




THE 26 words rimming these pages make up the new alphabet adopted this month by the International Civil Aviation Organization (ICAO). They are intended for use by pilots, radiomen and control-tower operators when poor communications or language difficulties make it advisable to spell out words.

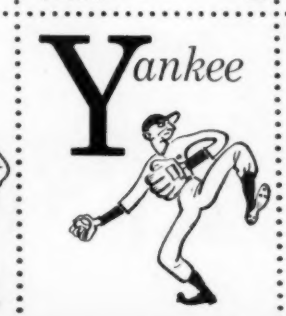
To qualify for the ICAO alphabet, every word had to meet rigid requirements: (1) begin with the letter that it represents; (2) be pronounced with understandable similarity by speakers of many nations; (3) cause a minimum of confusion with any other letter word; (4) have some meaning for users of most nationalities.

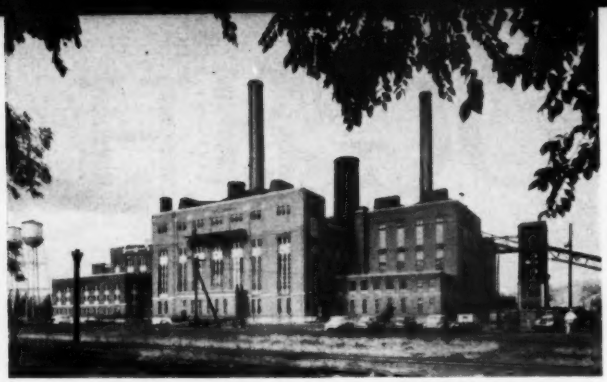
New ABCs



One of the most important uses of the alphabet is with plane-identifying letters and letter codes. A pilot making a landing approach in a plane with the identifying letters RJH, for instance, might say over his radio: "This is RJH. Now I spell. This is ROMEO–JULIETT–HOTEL."

This is the second revision of the ABLE, BAKER, CHARLIE alphabet that millions of GIs learned during World War II. ICAO hopes that the new alphabet, arrived at after thousands of tests here and abroad, will eventually become the standard, replacing some 75 word alphabets now in use throughout the world.—*Herbert O. Johansen.*



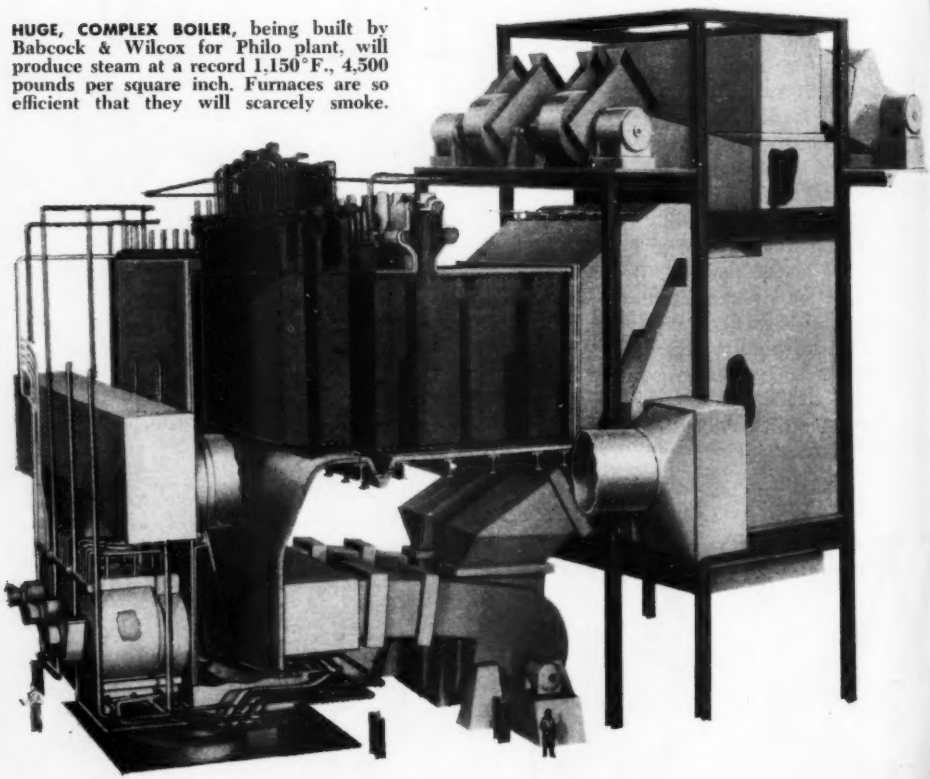


WORLD'S MOST EFFICIENT steam boiler will be fired up this spring as a new unit in the Philo generating plant of the Ohio Power Co. on the Muskingum River near Zanesville. Conveyor at right in photo brings in coal, which is ground to powder and blown into furnaces.

Squeezing More Power from Coal

A new Ohio generating plant will set a record by burning less than 11 ounces of coal to make a kilowatt-hour of electricity.

HUGE, COMPLEX BOILER, being built by Babcock & Wilcox for Philo plant, will produce steam at a record 1,150°F., 4,500 pounds per square inch. Furnaces are so efficient that they will scarcely smoke.



By Harland Manchester

WHILE dramatic prospects of power from the atom and from the sun have stirred the public imagination, a revolution has been quietly taking place in today's electric power plants. The major source of electric power now is coal, which is burned to make steam to turn the turbines which run the electric generators. Dams account for about 21 percent of our electricity, and gas and oil play a part, but coal is still the solid base of our power, and will be for many years to come.

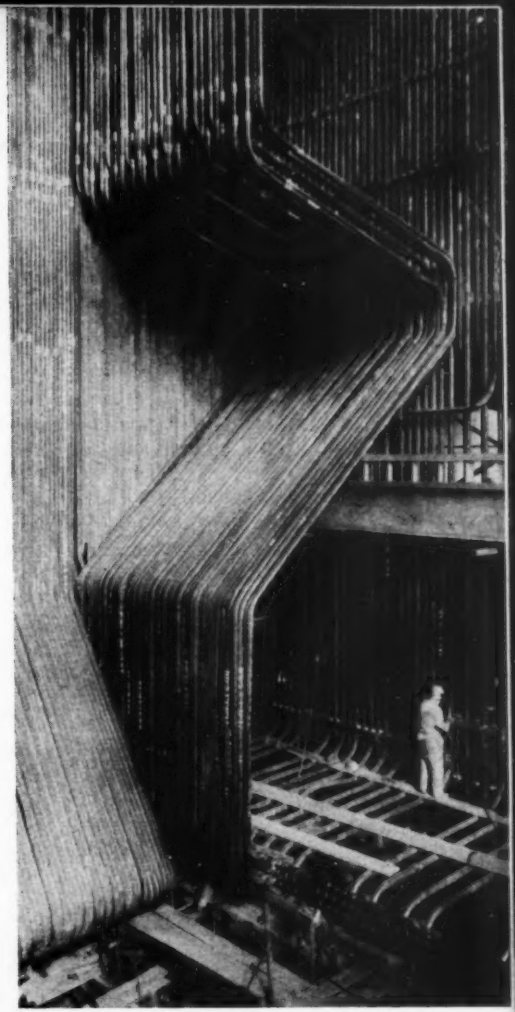
Year by year the industry has been squeezing more power out of a pound of coal—and the cost of electricity has been going steadily down for three decades, even though the general cost of living has been zooming upward.

In 1920 it took three pounds of coal to produce a kilowatt-hour of electricity —enough to run a 100-watt bulb 10 hours. Since then, that heap of coal has been steadily reduced, ounce by ounce, with annual savings running into many millions of tons and dollars. Today it has been reduced to less than a pound, and we are now on the threshold of brilliant new triumphs in power-plant design which will cut it still lower.

Breakthrough on the cost front. This May, leading engineers will gather at Zanesville, Ohio, to witness a major breakthrough in cheap power production. When the switch is turned on in a new unit of the Philo plant of the Ohio Power Company, a new world economy record will be set—for this plant, of a size to supply 250,000 homes, is designed to burn only two-thirds of a pound of coal per kilowatt-hour.

Plans to build a larger plant of the same radical new design have been announced by the Cleveland Electric Illuminating Company, and next year the Philadelphia Electric Company will open a still larger plant, which, its engineers figure, will cut that heap of coal to about three-fifths of a pound.

These three plants will turn out power enough to supply nearly a million and a half homes, at an estimated saving of almost half a million tons of coal a year compared with today's average plants. Although these highly efficient plants will turn out only about one-half of one percent of the country's electric power, they will set a standard for future construction, with profound effects upon the national economy as well as the customer's light bill.



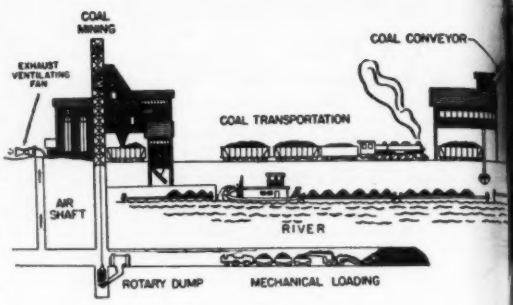
NINE AND A HALF MILES OF TUBING line a boiler that rises 10 stories above the floor in the Philo plant. As flames lick the tubes, water inside flashes into steam without boiling.

Pouring on the steam. Many improvements in furnaces, boilers and turbines have played their part, but the nub

of the great efficiency drive has been a constant increase in the pressure and temperature of the steam. In any engine, the hotter the steam or gas it produces, and the more heat converted into energy on the way through, the greater is the power obtained from the fuel.

One of the first steps in making hotter steam came with the discovery that if you ground up the coal as fine as face powder and blew it into the firebox, you could get far more heat out of the coal than by burning it in lumps. Today all big plants burn pulverized coal, but when it was first tried at the Oneida Street plant in Milwaukee in 1918, there were many scoffers.

Early pioneering was done by two young marine engineers, Fred Dornbrook and John Anderson, who worked on hand-stoked steamboats. Dornbrook, now 80 and retired, got his first hunch when he was an oiler, in 1900, on the



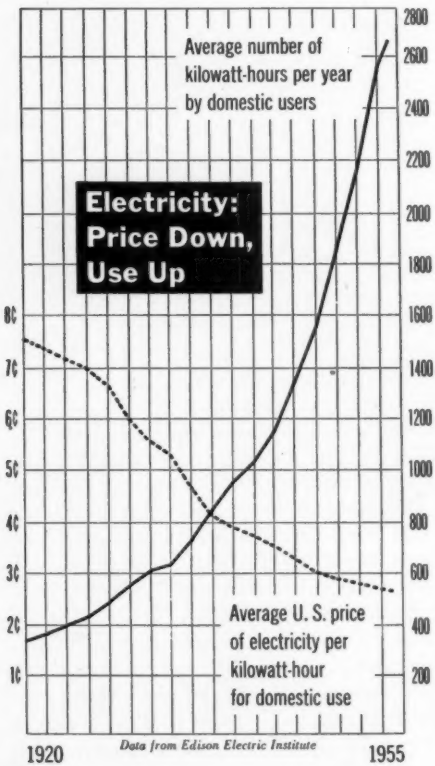
How a steam plant turns coal into electricity.

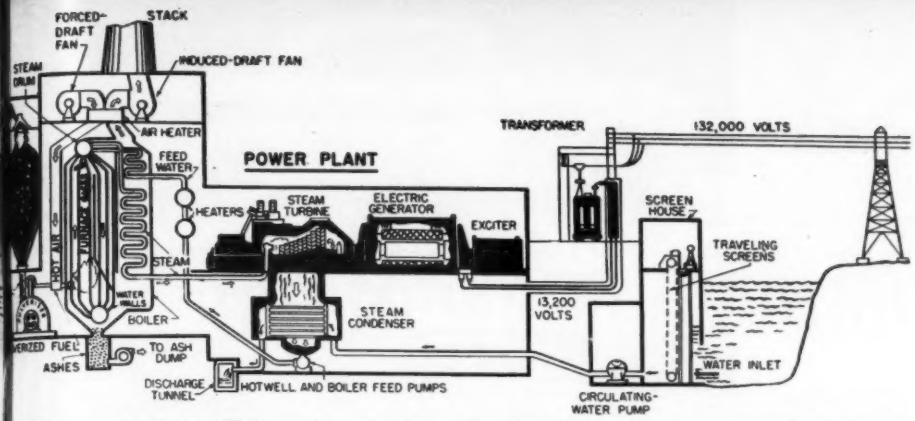
cranky coal-and-ore freighter *Angeline*, which plied Lake Michigan out of Milwaukee. The fleet owners paid an annual bonus to the boat with the best fuel-economy record, and the *Angeline* was at the bottom of the list. The boiler room was so hot that there was a fast turnover in stokers. Dornbrook, a mechanically ingenious farm boy, refitted a boiler and tried new ways of feeding the fire.

Dusting the fire. At that time the fine coal that broke off the lumps was considered a nuisance and was often thrown overboard. Dornbrook flirted with death by tossing this dust on the fire, and found that the steam gauge responded. He got a sieve and saved fine coal for his experiments, and soon the *Angeline* rose to second place in the fleet. But one day Dornbrook made the fire so hot that it burned out the furnace wall.

Undismayed, the chief engineer told him that he had a good idea, and Dornbrook drew sketches of a machine like a farm feed grinder that would powder the coal and carry it into the firebox. But his machine was just too big for the available space; the *Angeline* chugged along without it.

Dornbrook took to the shore and began working in power stations, telling anyone who would listen that you could burn coal more efficiently if you ground it up, so that more of the coal's surface would be exposed to oxygen and fire. Pulverized fuel was already being used in cement plants, metallurgical furnaces, locomotives, and in a few boiler furnaces,





The secret of its efficiency is pulverizing the fuel for hotter, more complete burning.

but few people thought it practical for boilers.

In John Anderson, Dornbrook found a fellow believer in pulverized coal. The two engineers ground up, sifted and burned many tons of coal, and, with the aid of the then Locomotive Pulverized Fuel Company, finally worked out a plan for a pulverized coal burner that interested executives of the Milwaukee Electric Railway and Light Company (now Wisconsin Electric Power Company).

New problems, new solutions. The new fuel caused a number of explosions and created new problems that took years to solve. First they ran the coal through a crusher, then through a ball mill and a fine screen. Bits of "tramp" iron in the fuel punched holes in the screen, so they worked out a magnetic device to remove these bits. The moisture in the fine fuel turned it into mud, and a hot-air drying device had to be installed. The high pressures and temperatures made possible by the powdered coal ruined various furnace parts, so the whole unit had to be redesigned.

Finally the new system was tried out on one boiler of the old Oneida Street plant—a cheap guinea pig because it was soon to be retired. The idea looked promising. More boilers were fitted, and tests showed that substantially more heat was obtained from the coal than in the average plant.

As a result, the company built the Lakeside plant near Milwaukee—the first full-scale utility plant fired exclusively with pulverized coal. This plant, opened in 1920, soon broke all records in fuel economy and became a Mecca for power engineers from all over the world. When it was built, even the most advanced plants used about two pounds of coal to produce a kilowatt-hour. Constantly improved and enlarged, the Lakeside plant cut this figure in half in one decade.

Following the leader. Lakeside gave the whole industry a mark to shoot at. A few years after it opened, similar plants were built in St. Louis, Denver, and Detroit. Since most utility plants are operated at least 25 years before being replaced, the whole industry cannot be revolutionized overnight, but practically every big coal-burning plant built since 1935 has been designed to burn the pulverized fuel. As this took place, pressures and temperatures of steam throughout the country went steadily up, while the coal needed to make a unit of power went steadily down.

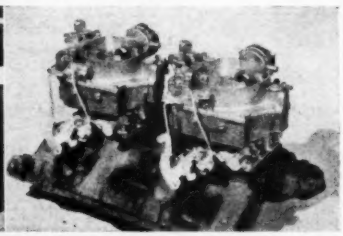
At every advance, engineers have run into the same problem that Fred Dornbrook met when his hotter fire burned out the furnace of the old *Angeline*. With each increase in pressure and temperature of steam, metals once suitable for boilers and pipes would quickly disintegrate, and rugged new alloys had to be found that could take it.

Once it was thought that there was a final barrier to making hotter steam, comparable to the sound barrier in aviation. If you heat locked-in water to a high

[Continued on page 267]

Plymouth

A golden and white hardtop, the Fury has a 240-horsepower engine. It has a displacement of 303 cubic inches and a compression ratio of 9.25:1. A four-barrel carburetor and high-output valve train are standard, helping the Fury to set a 124-m.p.h. record recently. Shift-loving drivers can get this car with a manual transmission if they want one.



Dodge

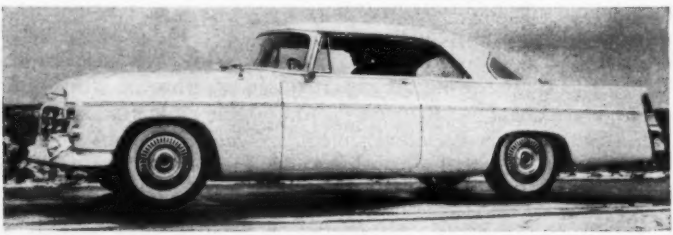
The "500" chassis, which involves a lowered suspension and a high-output engine, can now be had with several Dodge bodies, including convertibles and hardtops. Its 315-cubic-inch engine, with 9.25:1 compression, is rated at 260 horsepower with one carburetor. A special intake manifold (above) to carry two four-barrel carburetors is optional.

Chrysler Builds New Family of Stock Hot Rods

FOR buyers with an uncontrollable urge to have the mostest, the Chrysler Corporation offers an array of high-performance vehicles. They get their zip, to a considerable extent, from the use of speed-shop equipment—though now it's factory-installed.

DeSoto

The Adventurer, an extra-lush hardtop with a gold-painted engine and flecks of gold in its black carpeting, tucks 315 horsepower under its hood. Increasing the bore raises the displacement to 341 cubic inches, and there is a high-lift camshaft. Power brakes, an automatic transmission, and a brace of four-barrel carburetors are standard equipment.



Chrysler

The 300B, called by its maker the highest-powered car in America, is now rated at 340 horsepower at 5,200 r.p.m. Torque is 385 pound-feet. Buyers who want to sling it around can get special wide-rim wheels for better cornering. New this year: an optional manual gearbox and a choice of 14 different axle ratios ranging from 3.08 to 6.17.

Comic Strip Reports the News in Aviation

At times "Buz Sawyer" and his creator even beat Page 1 with stories of our new jet planes.

By David R. Lindsay

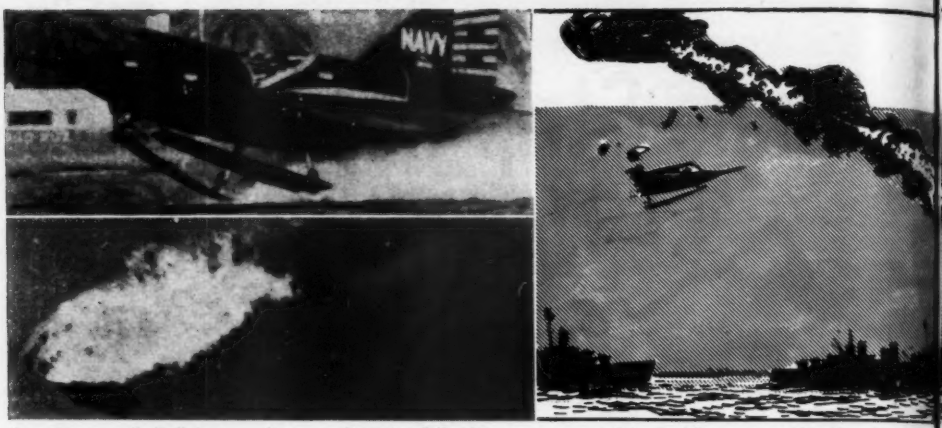
WHEN the Martin Sea Master, a multijet experimental Navy seaplane, crashed recently, real life was unfortunately following fiction. The Sea Master had been in the cast of "Buz Sawyer," a syndicated comic strip about the adventures of a Navy pilot. In the strip, the plane had cracked up only a short while before.

A few months earlier, the comic strip had carried the story of another crash—the explosion of the Sea Dart, an experimental Navy jet seaplane with retractable skids instead of floats. The comic-strip version of the accident was published about three weeks after the plane actually exploded on a test flight, and accurately depicted the tragedy.

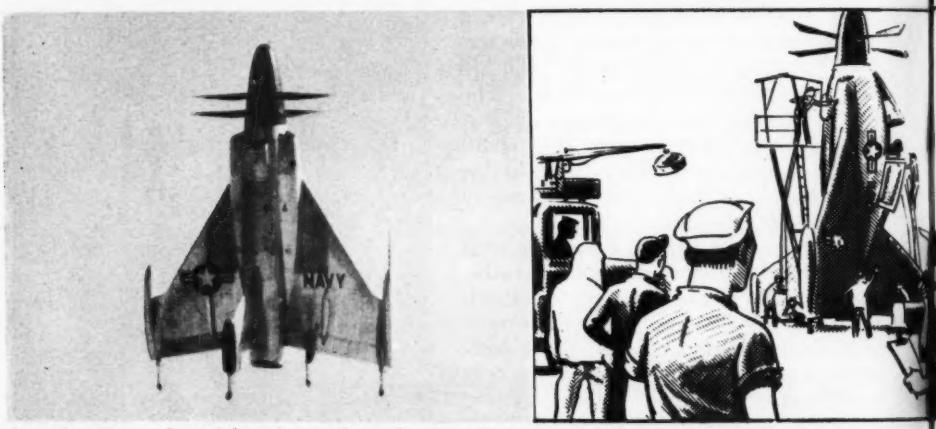
Navy thank-you note. After the Sea Dart tragedy, Admiral Apollo Soucek, then Chief of the Navy Bureau of Aeronautics, wrote an unusual fan letter to Roy Crane, the artist who originated and still turns out "Buz Sawyer," and who had witnessed the explosion of the Sea Dart. The admiral said:

"I know of no medium whereby the Navy's activities are so accurately and dramatically painted as in your pictures. Specifically, I believe your portrayal of

LIKE A REPORTER, cartoonist Roy Crane covers demonstrations of new aircraft. Here he is taking down some notes at the first public showing of the Navy's vertical-rising Pogo plane.



Sea Dart exploded (news pictures above) while Crane was watching with a party of newsmen.

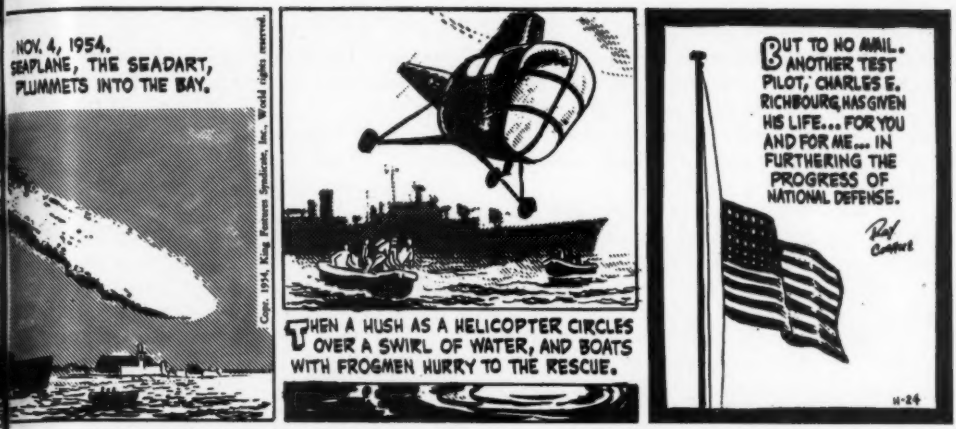


Amazing Pogo plane (above) was flown by Buz Sawyer soon after its first public appearance.

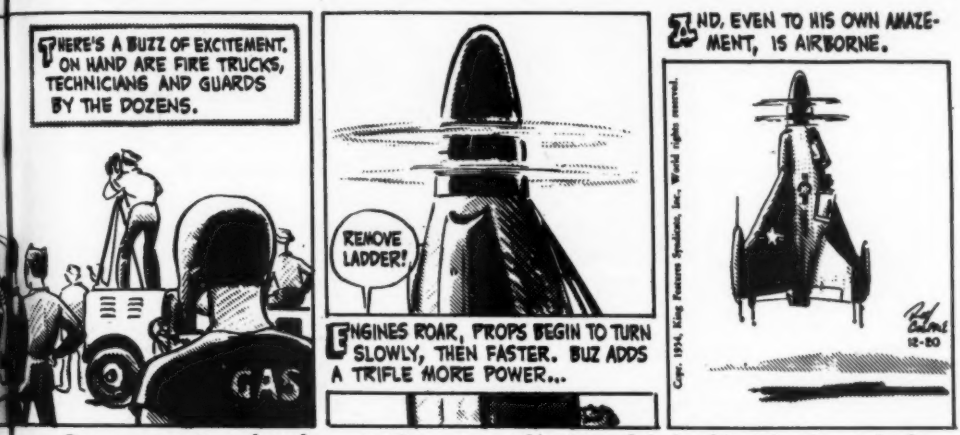
the loss of the Sea Dart is one of the best things that has been done. We all recognize the hazards that our pilots take, but it seems to me that you paid a fine tribute there to Richbourg [the pilot of the real Sea Dart]. I would like to compliment and congratulate you on this fine service. . ."

Earlier in the cartoon strip, the Sea Dart and another plane had been shown being used to try out a new "cushion-landing" device—a flexible rubber aircraft-carrier deck intended to cut down on the space needed to land high-speed planes. When the sequence involving the rubber deck hit the newspapers, some official eyebrows were raised. The Navy, it turned out, had actually been testing such a device but keeping it under wraps. Crane had not been guilty of any security leaks, however; he hadn't even known of the Navy's work. He had simply spotted an obscure story about French and British cushion-landing tests in a trade magazine, and let his imagination do the rest.

A head start on Edna. Another time, Crane wanted to have his hero, Buz Sawyer, do some hurricane chasing. For this he dreamed up a ripsnorter of a storm which he named Edna. Of course, just after that was printed, the real Edna blew roofs off all along the east coast. A lot of readers immediately wrote in want-


NOV. 4, 1954.
SEAPLANE, THE SEADART, PLUMMETS INTO THE BAY.
Copr. 1954, King Features Syndicate, Inc., World rights reserved.
THEN A HUSH AS A HELICOPTER CIRCLES OVER A SWIRL OF WATER, AND BOATS WITH FROGMEN HURRY TO THE RESCUE.
BUT TO NO AVAIL. ANOTHER TEST PILOT, CHARLES E. RICHBOURG, HAS GIVEN HIS LIFE... FOR YOU AND FOR ME... IN FURTHERING THE PROGRESS OF NATIONAL DEFENSE.
Roy Crane
11-24

Three weeks later his comic strip, "Buz Sawyer," retold story, paid tribute to the pilot.


THERE'S A BUZZ OF EXCITEMENT. ON HAND ARE FIRE TRUCKS, TECHNICIANS AND GUARDS BY THE DOZENS.
GAS
REMOVE LADDER!
ENGINES ROAR, PROPS BEGIN TO TURN SLOWLY, THEN FASTER. BUZ ADDS A TRIFLE MORE POWER...
AND, EVEN TO HIS OWN AMAZEMENT, IS AIRBORNE.
Copr. 1954, King Features Syndicate, Inc., World rights reserved.
Roy Crane
12-20

Crane, present at that demonstration, accurately pictured it in this strip six weeks later.

ing to know how Crane had had advance word. Roy insisted that he had no crystal ball but just knew how the Weather Bureau names hurricanes.

The man who keeps Buz Sawyer so up-to-the-minute, and often ahead of the news, has never piloted a plane, never studied aeronautics, never been in the Navy or any other armed service. Roy Crane is a short, slight, thoughtful man of 54 with rimless glasses and a little mustache, who says he decided to be a cartoonist because he thought it would be an easy life. As it turned out, he has had to work like a dog.

Getting the facts. A perfectionist, both as a cartoonist and as a reporter, Crane is never satisfied with his work. He has frequently scrapped finished strips, which his syndicate considered fine, because he felt that he could improve them a little. He follows aviation trade journals carefully, goes on press junkets to see new planes (he flew to California to look at the Navy's vertical take-off Pogo plane, then used it in his strip), maintains a clipping and picture morgue that fills several large filing cabinets, and spends $150 to $200 a month on long-distance phone calls from his Orlando, Fla., home to aviation-company engineers, test pilots, and Navy experts all over to get his facts and drawings straight.

His newsiness and meticulousness have

helped to make his strip one of the most successful of the adventure cartoons. His syndicated feature appears in 450 domestic papers and around 100 others, with a combined readership of several million people.

Atomic beat. Roy Crane's list of "beats" rivals that of many top newsmen. As he says, sometimes they get "too hot for comfort." The reason the new Sea Master got into his strip was that he wanted a plane that could be powered by atomic engines. Without any official information at all, he tried to figure out what the Navy might do. He reasoned that the plane should be large, have several engines, and be a bomber so that the first atomic engine could be lowered from the bomb bay for the initial tests. For unlimited landing and take-off space he picked a seaplane.

SCALE MODELS in Roy Crane's studio at Winter Park, Fla., help him keep his comic-strip drawings accurate. Here Crane is working out a sequence that shows the Pogo taking off from an icebreaker in the Arctic.

After his episode about the atom-powered version of the Sea Master appeared in "Buz Sawyer," the Secretary of the Navy confirmed Crane's reasoning by announcing that the Navy was considering the Sea Master as a prototype for a possible atomic-powered seaplane.

As in the case of the Sea Master, Roy's biggest news beats have come when the Navy has given him no help at all and he's had to depend on his own imagination and horse sense.

Buz gets there first. During World War II that happened when he wanted to have Buz Sawyer fly an intelligence officer to a Jap-held island for an invasion. After studying maps, Crane decided that a likely spot for the next landing would be off New Guinea, so he chose an island there called Halmahera. As soon as his story had started in the papers, the Navy really landed on an island just four miles from Halmahera and an officer he met told him off before he learned that Roy had stumbled on the spot for his plot quite by accident.

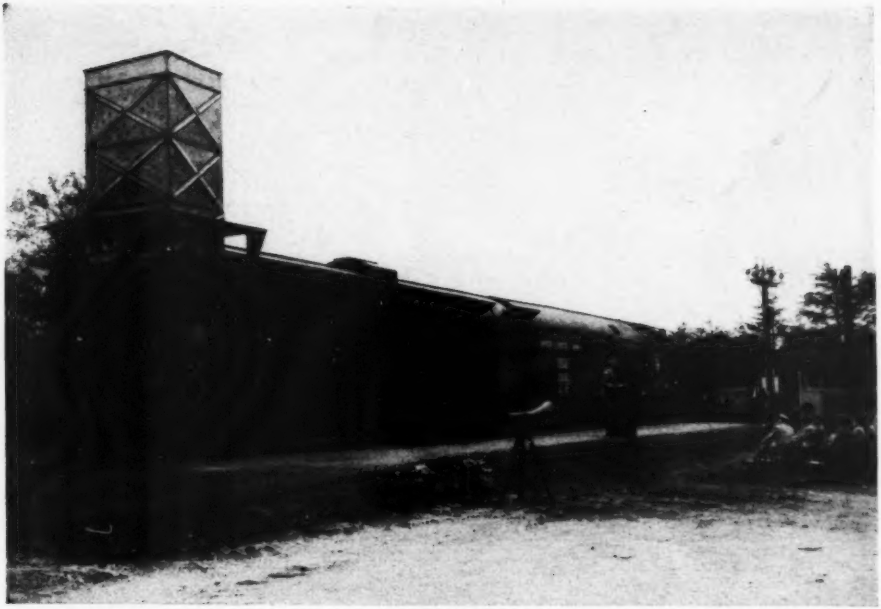
What causes most of his headaches, Roy says, are tiny details of planes, ships, uniforms, and jargon. He draws planes from models when he can, because photographs never show them at quite the right angle. Once he had an assistant make a model when he couldn't get one any other way.

When Roy was starting "Buz Sawyer," he visited the Navy Department in Washington and was shown through the picture files. The Wave who escorted him assumed that he'd want a few pictures of the planes and ships he'd be drawing, but Crane also wanted background material. Finally the Wave asked him how many pictures he had picked. "I didn't count them," he told her, "but I think between 800 and 1,200."

Troubles are uniform. Even with the photographs and with the sketches he's made on the spot on trips aboard carriers and visits to air stations, he still occasionally makes a slip. The two that brought him the most mail were both on uniforms. He once drew Buz Sawyer's blues with the five-pointed star on his sleeve turned so that one of the points was aimed squarely at the stripes. It should have been rotated a few degrees so that *two* arms pointed at the stripes. Another time he had a Marine with his tie tucked in. As thousands told him, Marines don't do that, only the Army.

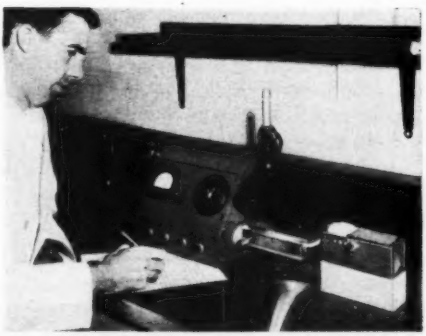
Born in Abilene, Tex., and raised in Sweetwater, Roy attended Hardin-Simmons University for a year and the Uni-

[Continued on page 258]



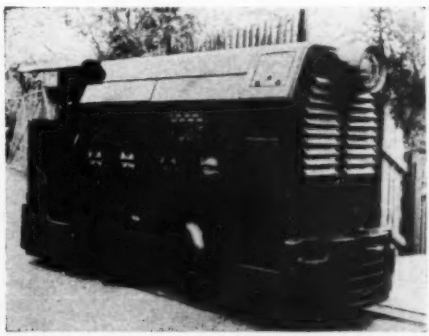
Gas-Turbine Generator to Bring Power to Disaster Areas

THIS track-riding power plant can roll into a town crippled by flood, fire or hurricane and turn on the lights in the homes of 20,000 people. A Westinghouse gas-turbine generator, it is now under test by the Corps of Engineers at Fort Meade, Md. For Army use, the two railway cars have interchangeable axles, wheels and brake lugs so that they can be used anywhere in the world.



"Ouch Meter" Tests Pain Killer

WHITE rats are helping lab men test pain killers. Stimulated by heat, a drugged rat (in the cage at right) moves his tail and a photocell stops a timer. By comparing reaction times, Upjohn technicians measure the effectiveness and dosage requirements of new analgesics.



Red Engine Goes Underground

THE tractor-size locomotive above will do most of its work underground, hauling coal from Czechoslovakian mines. The BND 15 is smaller but more powerful than older pit engines used in that country. The midget can be broken down into three sections in half an hour.

Aluminum Sports Car Has Roll-Away

A NEW "dreamboat," with probably the most European-like lines ever tailored into an American car, has been put on display by Pontiac. But everything else about the vehicle is strictly U. S.

It will delight people who like gadgets. It will baffle the purists among sports-car lovers. For that's what it's meant to be—a sports car. But look what it's got:

Item—an engine of over 300 hp.

Item—a transmission mounted behind the seats.

Item—twin bubble windshields.

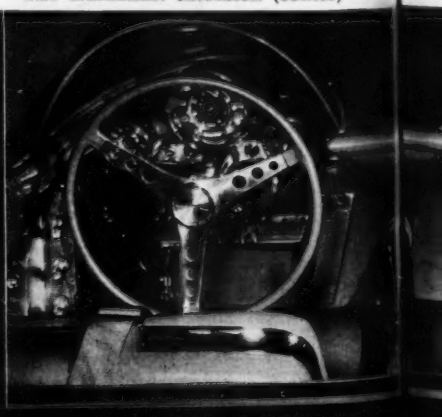
Item—combination shoulder harness and seat belts.

Item—controls recessed in the door panels and on a between-seats pedestal.

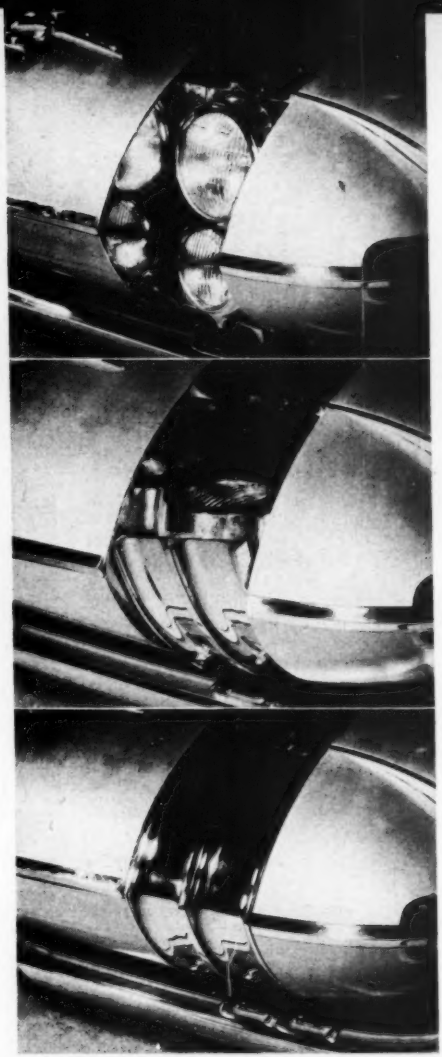
Item—a brushed-aluminum body.

Item—disappearing headlights.

Radio, ignition key share pedestal with gearshift lever. **The crankshaft extension (center)**



A ROAD-HUGGER, Club de Mer is only 38.5 inches high, 69.8 wide, 181 long. The engine has 10:1 compression, two four-barrel carburetors.



DISAPPEARING HEAD and parking lights revolve on a motor-driven pinion. The long aperture below them is an air scoop for carburetors.

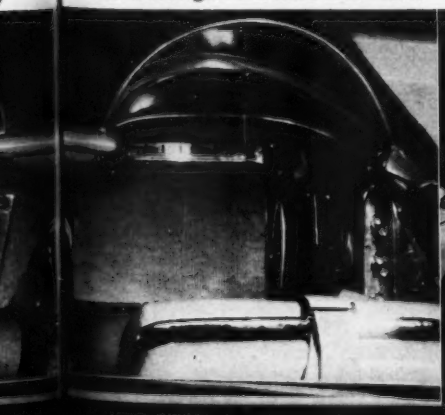
Lights

Item—a dorsal fin.

Except for the fin, the lines of the Club de Mer, as Pontiac calls it, are from a European drawing board. The car is described as "an experiment in simplified functional sports-car design."

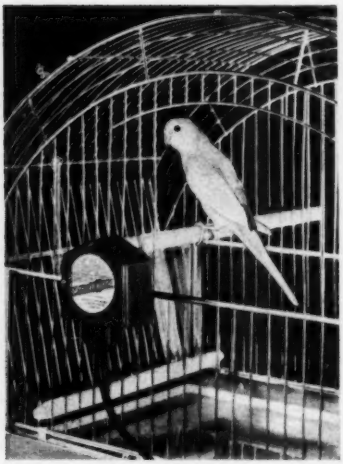
Built exclusively for show purposes (as part of General Motors' 1956 Motorama), it stands only the slimmest chance of reaching a production line.

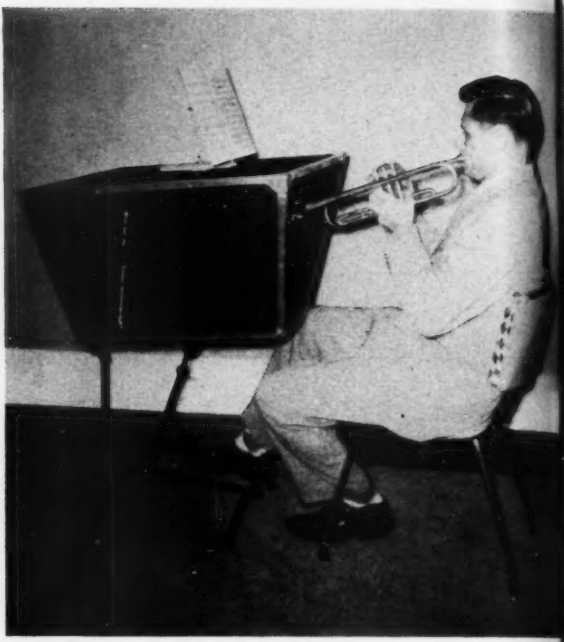
to a rear gearbox adds foot room.



Shoulder harness and spring-steel spokes protect driver.

New Aids to Living

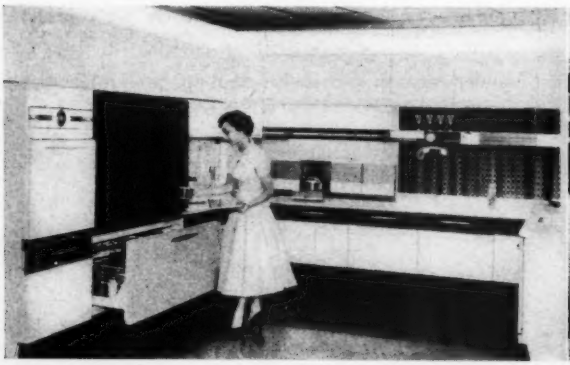




1 Electrically heated perch helps birds keep warm on cool spring days as well as in winter. It plugs in. Your parakeet or canary regulates its own temperature by sitting near either the warm or cool end of the rod.

2 Music dampener lets the musician practice all he wants without alienating members of his family or neighbors. Acoustic enclosures, lined with sound-absorbing material, are designed for trumpet (above), clarinet, trombone, saxophone and other instruments. While the boxes deaden sound, musicians still hear their own notes.

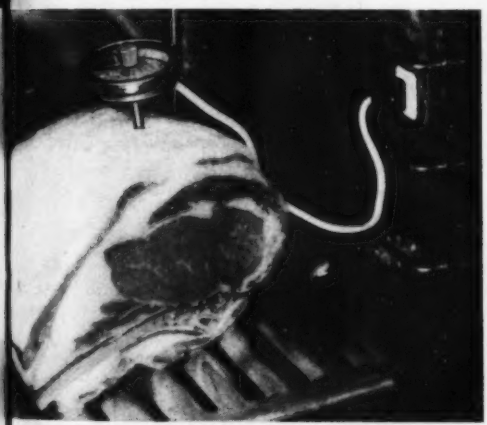
3 Modular kitchens will be on display this spring and are scheduled for mass production late this year. Designed as free-standing units with their own interior walls, they will be attached by a home builder directly to the wall struts and leveled on a floor rail. The parts include built-in counters, cabinets, range, refrigerator, freezer drawer, radio and even a cigarette lighter.



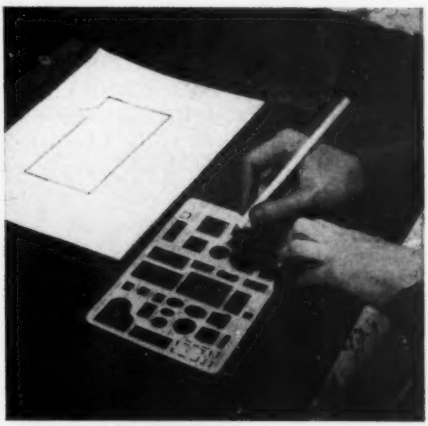
4 Flexible doorstop will bend to advancing equipment and make life less painful for passing ankles or a child at play. The little rubber bumper also protects the wall from a thumping doorknob.

5 Matching switch plate is made by inserting a piece of drapery or wallpaper behind the clear-plastic plate of this one-button, tap-on-tap-off light switch. It connects to wiring by screwless terminals.

6 Pocket socks combine utility and style for the bobby-soxer set. The knitted pockets are extra cuffs just below the tops. They have enough tension and depth to hold a latchkey, lipstick and small change.



7 Meat thermometer turns off the oven automatically when the roast is done. The thermometer, standard equipment with a new electric range, is set for the way you like your roast—rare, medium or well done—and plugged into a socket in the oven wall. A signal light goes on to let you know when the oven shuts off.

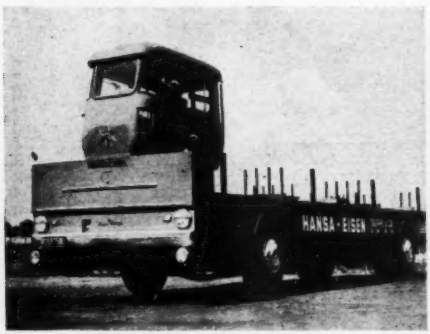


8 Furniture template lets you trace and cut out furniture shapes, scaled ¼ inch to the foot, for use with a room plan of the same scale when you want to change an arrangement. One template includes stencils for most of the furnishings usually found in a living room, bedroom, dining room and kitchen.

Further information on the products shown on these pages can be obtained from: 1. Drouet & Richmond, 331 Medical Center Bldg., Eugene, Ore.; 2. Acousti-Practice Co., P.O. Box 2248, Cleveland 9; 3. Frigidaire Division, General Motors Corp., Dayton 1, Ohio; 4. Ajax Hardware Mfg. Corp., 4351 Valley Blvd., Los Angeles 32; 5. Minneapolis-Honeywell Regulator Co., 2753 Fourth Ave. S., Minneapolis 8; 6. Beaux-Knit Hosiery Co., 350 Fifth Ave., NYC 1; 7. Kelvinator Division, American Motors Corp., Detroit 32; 8. A. Lawrence Karp, 16 Putnam Park, Greenwich, Conn.

What Goes On Inside an Oil Derrick Setting a New Record

THIS driller's-eye view (looking up) was taken inside the derrick over the Richardson & Bass well in the Louisiana marshlands as the old depth record of 21,482 feet was passed. In the left foreground is the traveling block on which the casing (from a 20-inch diameter at the top, down to seven) is suspended.



Driver Rides High in New Truck

THE cab is mounted high over an underfloor diesel on a new truck designed by Henschel of Kassel, Germany, for carrying iron beams. Windows at the corners under the windshield give the driver a chance to see the road below.

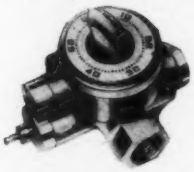
Mobile Radio Talks 2,000 Miles

THE new Army ridie-talkie above, used in jeeps, trucks and tanks, sends and receives messages within a 2,000-mile range. The operator need know only which knob to turn: the station tunes itself and its antenna automatically.

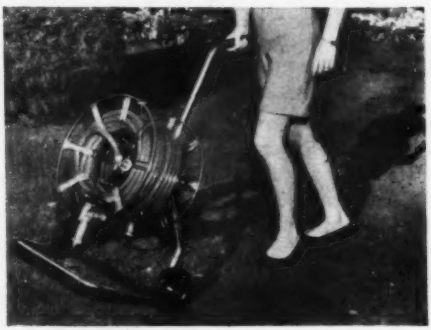
New for Gardeners

1. Power tap keeps a mower earning its way when it's not busy cutting grass. The flexible shaft couples to the crankshaft of most power mowers to run such attachments as hedge trimmers, other garden tools, or a buffer to polish your car.

2. Water timer turns off a sprinkler system so that you don't have to stick around to tend it, or worry about forgetting it. Set up for a quick shower or for a long downpour, it shuts off the water automatically after any number of minutes up to a full hour.



3. Hose caddy rolls easily from one outdoor tap to another. A connector hose running from a faucet to the hollow axle of the cart lets you unreel the hose while the water runs. The reel holds 200 feet of plastic hose, or 100 of rubber hose.



4. Push-button bomb treats rose bushes with a combination wet-dry spray. A liquid insecticide fights pests, a fungicidal dust wards off disease. The light-colored dust serves as a tracer, making it easy for a gardener to cover the target.

5. Triple trimmer has a swivel locking arrangement for switching handles so that you can do three jobs—lawn edging, lawn and hedge trimming—with one tool. The cutting blade is double-locked on the shaft for added safety when the ⅓-hp. motor spins it at 17,000 r.p.m.

Further information on these products can be obtained from: 1. Rocklin Mfg. Co., Sioux City, Ia.; 2. Kaye & Miller Machine Co., 9456 W. Jefferson Ave., Culver City, Calif.; 3. Specialty Mfg. Co., 2356 University Ave., St. Paul, Minn.; 4. E. I. DuPont de Nemours & Co., Wilmington, Del.; 5. Stranges, Inc., 794 Central Ave., Highland Park, Ill.

Gus Drives A Bad Bargain

By Martin Bunn

"Fifty dollars," Silas shouted into the wind.

WHEN Silas Barnstable, the town tightwad, showed up at Gus Wilson's Model Garage early one morning and announced that he was going to the city to buy a new car, Gus could hardly believe it.

"A new car!" Stan Hicks, Gus's helper, gasped. "I never thought to see the day."

"And why not?" Silas snapped, his wolfish features thrust over the door of his piston-clattering Model A Ford. "I know a bargain when I see one."

"Bargain?" Gus Wilson said. "But why drive 200 miles to the city, Silas? Our local dealers can take care of you."

"Hah!" Silas snorted. "They'd take care of me, all right, eyeteeth and all. I can beat their prices a mile. Give me five gallons of gas."

"Five gallons won't take you halfway," Stan Hicks told him, even though he knew the old reprobate's penchant for having an empty tank.

"Gas is a cent cheaper nearer the city," Silas announced with satisfaction. "I aim to get my money's worth."

"Can you beat that?" Stan Hicks said as Silas drove away with a grinding of worn gears.

"Well," Gus chuckled, "he did buy three gallons more than usual, and gas *is* a cent cheaper nearer the city. He'll save five cents, all told, on gas. I wonder how much he'll save on the car?"

GUS thought about this as he worked, knowing that there were certain car lots in the city that stocked standard makes of new cars, even though they were not authorized dealers. These cars were often advertised at reduced prices.

The night was wind-blown, with a spattering of rain, when Gus came back to the Model Garage after dinner to work on a rush job he'd promised out. He had finished the job and was cleaning up when the telephone rang. Picking up the receiver, Gus heard Silas Barnstable's thin voice over the wire.

"How much will you charge, Gus, to

"and they didn't fix it!"

come out and tow me in? I'm 10 or 15 miles out on the main highway."

Gus sighed, "Let's not worry about charges now, Silas. I'll be right out."

Gus found Barnstable standing beside a new sedan, parked on the highway shoulder. Silas was waving his arms, the wind whipping an ancient slicker about his skinny legs. Gus backed the tow truck into position and set out red flares, while Silas trotted beside him, chattering incoherently.

"Fifty dollars," he shouted into the wind, "and they didn't fix it! I'll get a lawyer. I'll sue. I'll—"

"Slow down, old-timer," Gus said soothingly. "What's the trouble?"

"I bought this car spanking new, mind you," Silas declared. "I was on my way home when it quit on me. There I was, 30 miles from a garage. I walked to a farmhouse—dratted farmer charged me 30 cents to phone the garage at Six Corners."

"Thirty cents," Gus said. "Then what?"

"Feller towed me in." Silas' voice took on a note of hysteria. "He charged me 50 dollars—50 dollars, mind you—to tow me in and fix things, and here I am again. Wait until I see my lawyer."

"Six Corners," Gus said. "Hmm, that's about 60 miles back."

RECALLING Silas' penchant for putting in two gallons of gas at a time, Gus snapped on the switch and looked at

the gauge. It showed that the tank was about a quarter full of gas.

"How much are you going to charge for a tow?" Silas demanded.

"May not have to tow you," Gus said. "There can't be much wrong with a new car like this. What did the Six Corners mechanic find wrong?"

"How should I know?" Silas wailed. "He towed me in to his garage, fiddled around under the hood for a while, then ended up by charging me 50 dollars and sending me on my way."

"Not too bad a charge," Gus commented, defending his colleague, "for a 30-mile round trip on a rainy night."

"But he didn't fix it," Silas protested. "I'm stuck again."

Gus made a routine check of ignition and timing, and when he couldn't start the car, pulled the air cleaner and squirted raw gas into the carburetor throat while Barnstable turned the motor over. The car started instantly, ran smoothly, then died.

"Gas trouble," Gus said flatly. "Maybe I'd better tow you in."

When they arrived at the Model Garage a check of the fuel pump showed that it was in good working order, yet when the line from it to the carburetor and gas filter was disconnected and the motor turned over, it would throw no gas through the tubing. Either the gas gauge was wrong, and there was no gas in the tank, Gus thought, or there was some foreign substance stuck in the gas line between fuel pump and tank. Gus disconnected the line and applied his air hose to it, while Stan Hicks listened at the rear of the car.

"There's gas in the tank," Stan announced. "I can hear the air bubbling into it."

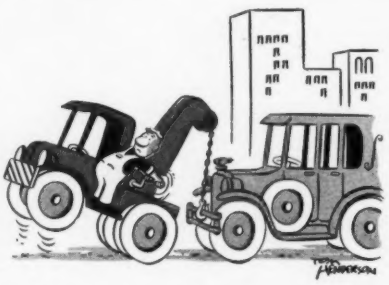
"Fine," Gus said, having killed two birds with one stone. If the gas line had been obstructed, it was now cleared.

Gus blew enough air into the tank to build up air pressure and then removed the air hose from the gas line. Air pressure in the tank forced a stream of gas back through the tubing. Gus hastily clamped a horny thumb over it to halt the flow and re-attached the line. Then he started the car easily.

"Well," Silas said caustically. "You finally fixed it."

"No," Gus told him. "Whatever was in the gas line is now back in the tank. I'll have to drain and clean out the tank, or you may stall again shortly."

"Oh, no you don't," Silas declared, hastily getting behind the wheel. "You fellers are all alike, always trying to work one job into three. I'm going before I get cleaned any more."



SILAS got his new car as far as the gas island. Then the engine quit on him again.

"We'll have to clean out the tank, Silas," Gus said grimly, as he and Stan turned to and pushed the car back in out of the rain.

Now what, Gus, asked himself, could be in the tank of a new car that would so quickly stop up the gas line again?

Maybe he'd have to take the tank off entirely, and then Silas would really scream. Gus hesitated before going back to work on that tank. Something was nagging at his mind.

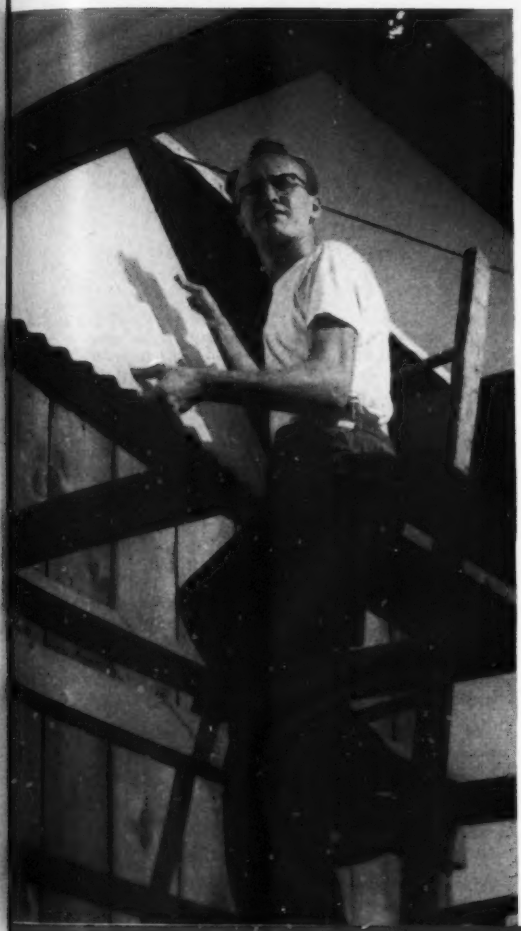
"Let's blow out the gas line again, Stan," he said finally.

This time when he had blown out the gas line, forced the gas tank full of air pressure and removed the air hose, he didn't put his thumb over the flow of gas from the disconnected line. He let the fuel run a moment, watching it thoughtfully. One good hunch deserves another, Gus told himself.

"Let's shove her out to the pumps again," he told Stan, "and fill her up."

"You'll just have more gas to drain out

[Continued on page 248]



How We Built a Plastic Greenhouse

By Jerry Parker

WE BUILT a greenhouse the easy way—with big, handsome sheets of plastic that you just nail up and forget. Actually, we like to call it our sun room because it's so warm and bright and pleasant that it can be used as an all-purpose extension to the house.

You have the fun of growing plants and flowers all year round if you have such a room. On cold or rainy days, it's a cheerful sitting room, or a

TWO BIG DOORS open the end of our 14′-by-18′ plastic greenhouse, converting it to a semi-outdoor play or sitting area. You can see how we attached the inner ends of the rafters to the house by nailing them to a 2″-by-6″ spiked to the wall. By opening the doors here and casement windows at the other end, we can cool the greenhouse quickly. Plastic side panels are 8′ lengths cut in half, providing 4′ sections without waste above the 3′ knee wall. Two rows of 8′ panels cover the roof.

1 **ABOVE-GROUND FOOTINGS,** 12″ wide and 10″ deep, were plenty sturdy in our mild California climate. In cold areas, or to meet building codes, extend footings below frost line.

2 **WE POURED CONCRETE,** then set in ½″-by-8″ bolts to anchor the 2″-by-4″ sill boards. Bolts, spaced every 3′ to 4′, were located to bring the sill flush with outer edge of footing.

semi-heated play area for weathered-in small fry. In hot weather, you can open it up to catch the breezes and bask in a covered patio with a built-in garden.

Our greenhouse is a simple lean-to design, with one side attached to the house and the other three walls resting on a light foundation. It's plenty spacious, too —14′ wide by 18′ long—yet the framing, siding and concrete cost only $100. Depending on the price of the plastic that you buy, you can build one like it for $300 to $400.

Why plastic? The tough, translucent glass-fiber panels that we used are easier to work with and actually make a better greenhouse than glass.

We liked the corrugated type, which has a modern textured look, but you can also get flat sheets. Both come in many colors and are sold by lumberyards, building-supply dealers, and some building-material mail-order houses. Standard sizes are 26″, 34″ and 40″ widths and various even-foot lengths up to 12′.

You can nail, saw, sand and shape the plastic like a piece of wood, using hand or power tools. By fastening the big sheets over a simple frame, you duck all the mess of cutting, fitting and puttying in glass. Unlike glass, the panels are also practically indestructible. They're waterproof, rotproof, vermin-proof and even proof against slashing hailstones, errant golfers and little boys with slingshots.

Plants grow better. Many big-time commercial florists who must police and maintain barn-size expanses of glass are now using plastic because it also transmits a better balance of light, including ultraviolet and infrared.

There are no shadows in a plastic greenhouse. The sunlight, gently strained through the translucent fibers, is evenly diffused and distributed. You can grow both sun-loving and shade-loving plants side by side because the plastic prevents leaf burn. You can grow them at all levels, from floor to ceiling.

One nurseryman told us that plants which twist toward the light in shadowed glass greenhouses—a condition called phototropism—remain straight and healthy under plastic. Their blooms even show a brighter color and better texture because of the filtered light.

Choosing a color. Some makes of plastic, such as the Alsynite that we used, are rated according to their suitability for greenhouses. We selected a milkish-white panel that transmits 45 percent of the light and is recommended for bright sunny areas.

Several mild shades of green let more light through—from 50 to 60 percent—and are recommended for medium sunny areas and southern exposures in northern areas. There are also some nearly clear panels that transmit from 75 up to 90 percent, but these should be used only in

3 FOUR-BY-FOUR POSTS, 7′ tall and 50″ apart, support 2″-by-6″ rafters on a 2″-by-4″ plate. Inner ends of rafters rest on plate spiked to house 1′ higher, pitching the roof downward.

4 STURDY CROSSBARS of 4″-by-4″ stock were nailed into notches in the uprights. These were set 36″ above sill to provide a nailing surface where siding and plastic panels meet.

areas that are extremely cloudy most of the time. Stay away from deep-tone colors that stop too much light.

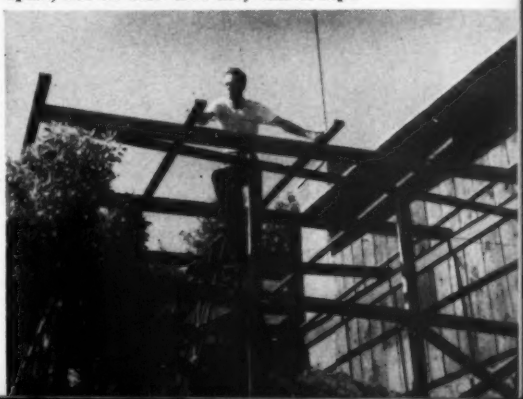
Prices vary. There are about 500 square feet of plastic in the roof and side walls of our greenhouse, which will help you figure your own cost. In most places, you'll pay somewhat more than you would for glass, but don't forget that there's no breakage, no maintenance, a lot less work, and a lot more looks. Average cost is about 68 cents a square foot, with some mail-order houses selling the sheets for 50 cents a square foot. If you happen on a sale, as we did, you may be able to get the panels for as little as 29 cents a square foot, which is just about as cheap as glass.

Putting up the panels. The only cuts that you have to make are for the 45° bevel on the wall pieces where they meet the siding. You can cut the plastic with a handsaw, though it's a little slow going. If you have a portable power saw or a radial-arm saw with a full blade guard, you can fit it with a reinforced abrasive cutoff wheel of the type used to cut masonry. Do not, however, mount an abrasive wheel in a table saw as the panels are hard to hold steady, and there is danger of shattering the blade.

The panels are fastened on with 2″ aluminum screw-shank nails that have neoprene washers. Nail every third or fourth corrugation across the width of

5 WE ADDED EXTRA BRACING at the corners this way. Lapped 2″-by-4″s fit neatly within 4″ thickness of wall, are toenailed to the posts and to each other at points where they cross.

6 TWO-BY-FOUR PURLINS were fastened across the rafters to give a nailing surface for the plastic panels. You can space them up to 4′ apart, but be sure that they fall at laps.



the panels and every 12″ or so along side laps if they fall on back-up strips. Always nail through the crown or peak of each corrugation—it's hard to hit the heads in the valleys. You can pre-drill the nail holes if you like, but we found that it really isn't necessary. Any small cracks that appear around the holes are sealed by the rubber washers under the nail heads.

Using the greenhouse. Many fancy installations have roof ventilators, but we just open the doors and windows and the place cools down quickly. Whenever it gets especially hot and steamy—and it can—we hose down the walls. The garden hose also supplies other needed water, saving permanent plumbing.

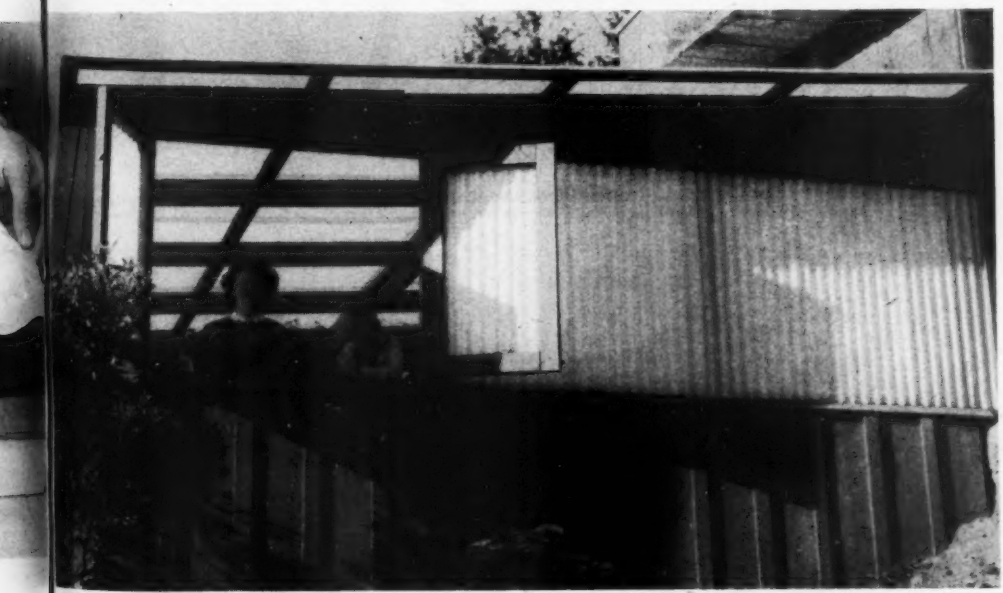
In chilly weather, one or two portable electric heaters, together with the radiated heat trapped from the sun, will give you just about all the warmth that you need. In cold climates, you may want to run a hot-water or steam line from your house, or add a couple of inexpensive radiant electric units or electric hot-water radiators, which need no plumbing.

7 ROUGH BOARDS were nailed on vertically for a rustic half wall, with top edges beveled 45° to take a sloping sill. You could also put on shingles or clapboards to match house.

9 BEVELED SIDE PANELS fit snugly against the slanted ½″-by-3″ sill, making a weathertight as well as decorative joint. Top edges, cut straight, were nailed to the plate. Battens were nailed over the joints in the siding.

10 RUBBER CLOSURE STRIPS, shaped to fit the corrugations, made it easy to build wind- and rainproof doors and windows. Frames were made of 2″-by-4″s, half-lapped at corners, and the plastic was nailed on through the strips.

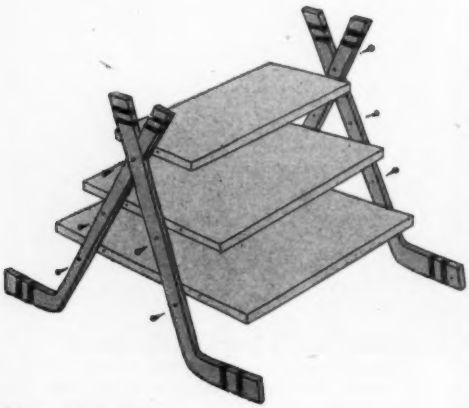
8 **ROOF PANELS** are 40″ wide by 8′ long and didn't need to be cut to fit. We started the first row at the roof's low edge so that the next row would overlap it to shed rain. Always run corrugations in the direction of slope for efficient drainage. We nailed the panels at the middle and ends, overlapping the sides one or two corrugations and the ends at least 6″.

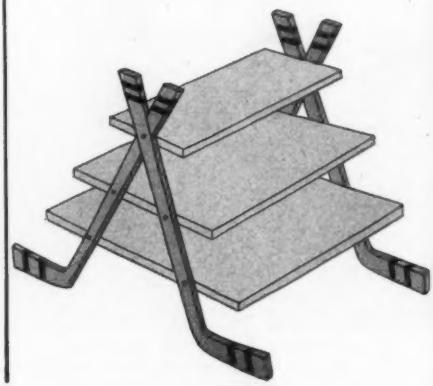


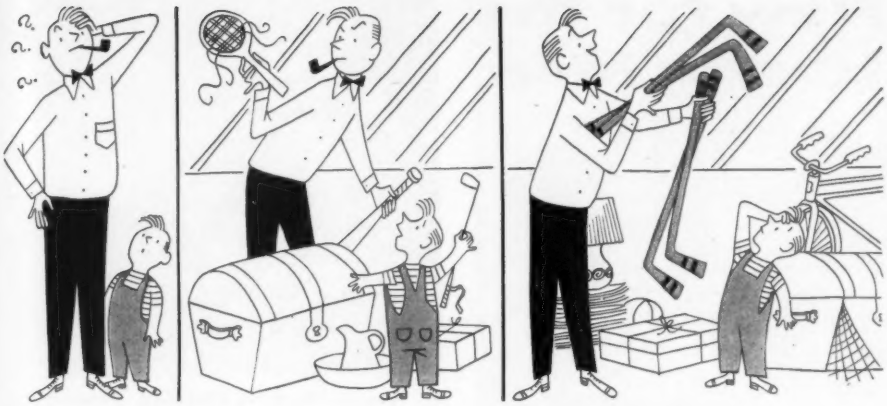
11 **WINDOWS ADD VIEW AND AIR,** making our greenhouse a sunporch, too. Rafters and purlins overhang walls 1′ all around, with rafter ends boxed in at the side. On the sloping end walls, we filled in the space at the top with short planks, cut to match the roof pitch. END

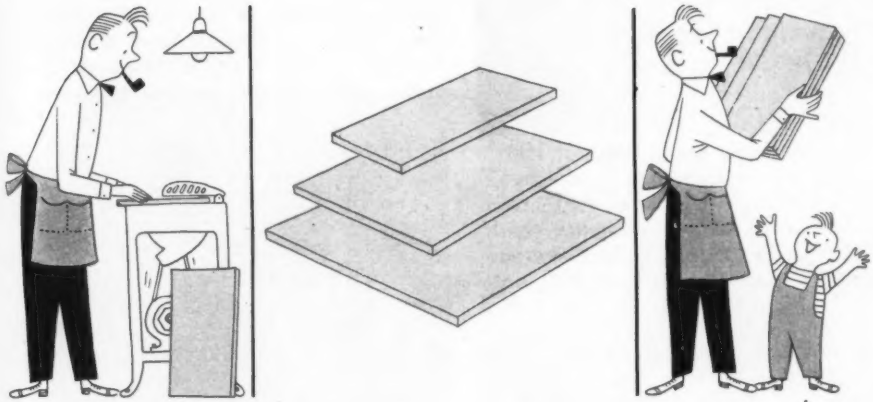
By Roy Doty

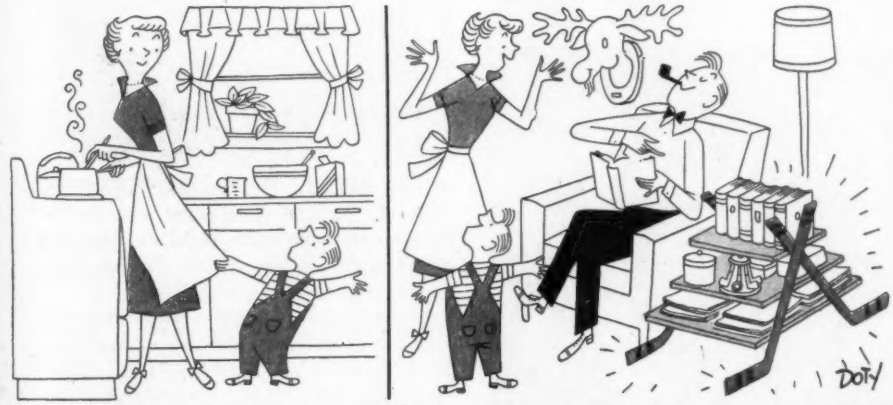
Wordless Workshop









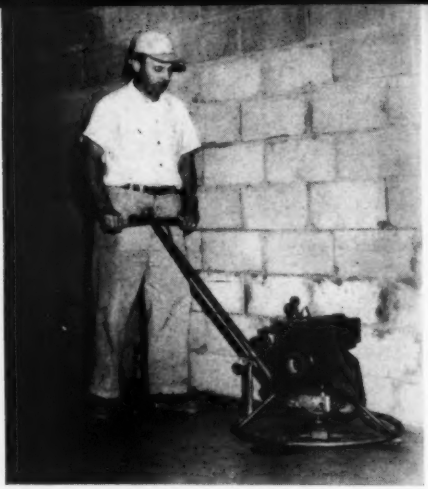


Next Month: A rack to keep your fishing tackle stored neatly

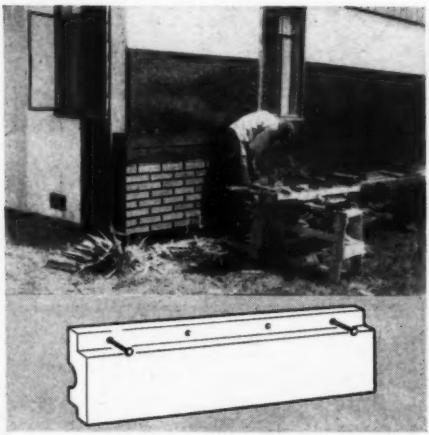
New for the Handy Man

2. Counter Tops Match Floors. Plastic covering for counter tops is now available in colors and patterns that match vinyl-plastic flooring for kitchen, bath, laundry and recreation room. The covering can be set with ordinary tools.

3. Lever Tool Pulls and Lifts. Using the spur-geared hoist below, you can uproot tree stumps, tighten fences or lift heavy loads with comparative ease. Turning the 12″ lever handle provides pull at the hook end of the hoist. An automatic brake holds the chain fast.

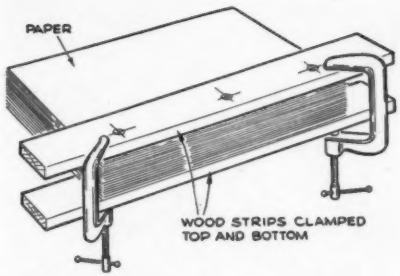


1. Trowel Machine-Finishes Concrete. After pouring a concrete basement floor, terrace or driveway, you can get a professional finish with the rotary trowel above. Controls in the handle adjust blade pitch for floating and finishing, regulate motion without stopping the motor. Many dealers rent the machines.



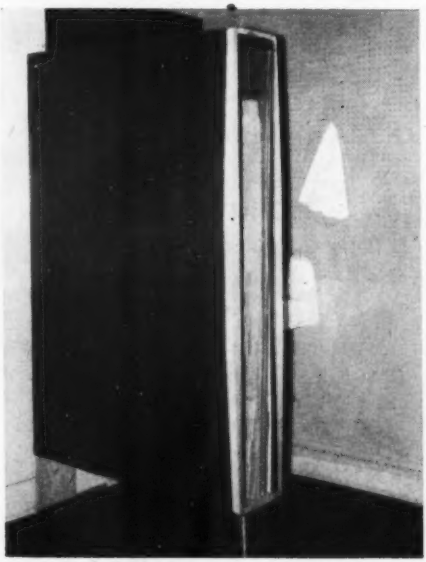
4. Bricks Are Nailed On. You can nail real brick veneer to any nailable surface through predrilled holes in these 1″-thick nail-on bricks. Overlapping lips form joints for mortar. The corners also overlap to make weathertight joints. The clay bricks come 2½″-by-8″ or -11½″ in size.

Further information on the products shown on this page can be obtained from: 1. Stow Mfg. Co., 443 State St., Binghamton, N.Y.; 2. Armstrong Cork Co., Lancaster, Pa.; 3. Manning, Maxwell & Moore, Inc., Muskegon, Mich.; 4. Ludowici-Celadon Co., 75 E. Wacker Drive, Chicago 1, Ill.



Drill Punches Holes for Binder

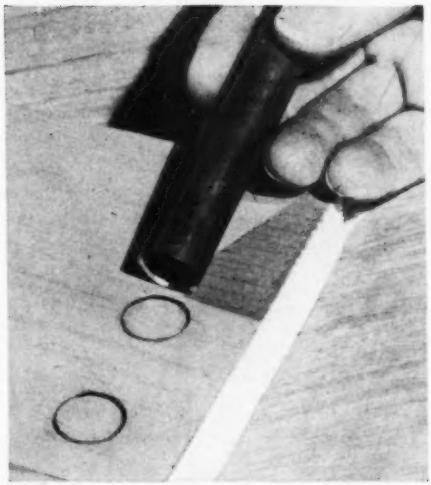
I HAD to bind 1,400 sheets of plain paper in a loose-leaf book, so I let my drill press do the punching job. I clamped the paper stack between wood strips, marked the hole locations on top, and drilled through wood and paper, easing the bit out occasionally. It took only two minutes to make 4,200 holes.—*Alfred E. Cavanagh, Carle Place, N.Y.*



Screen Doubles as Storage File

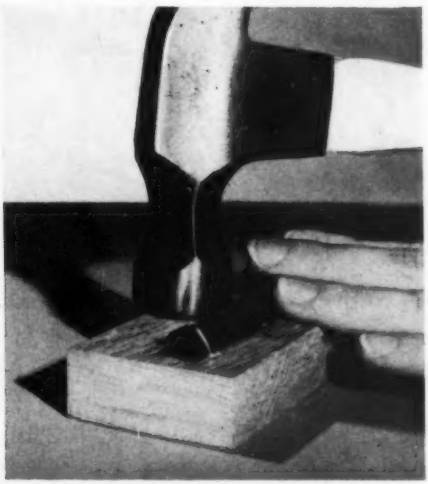
THIS screen conceals a wash basin in the office of Dowd-Swartwout Associates, Evanston, Ill., and provides storage space for large plans, drawings and supplies. The sides are tempered hardboard.

The end next to the wall rests on a board leg, while the wood-trimmed open end is supported by a piece of pipe.



Tube Gives Dowel-Peg Look

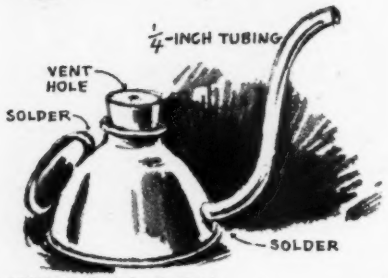
CIRCLES cut with a beveled tube give the effect of dowel pegs. Lay out logical points and rap the tube lightly over them with a mallet to form rings. Sharpen the tube by beveling the inside with a file.—*Frank A. Javor, North Bergen, N.J.*



Old File Helps Clinch Nails

HAMMER the projecting point of a nail over a worn triangular file, as shown above, for a perfect clinch. The nail won't back out from underneath and its point will go easily into the wood.

8 USES FOR Oil Cans



WINDOW-BOX WATERING CAN

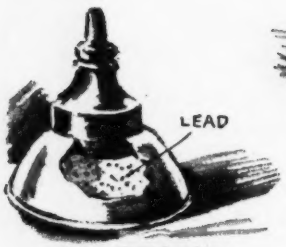
SPILL-PROOF AIR-RIFLE LOADER

GLUE INJECTOR

TOY JET ENGINE

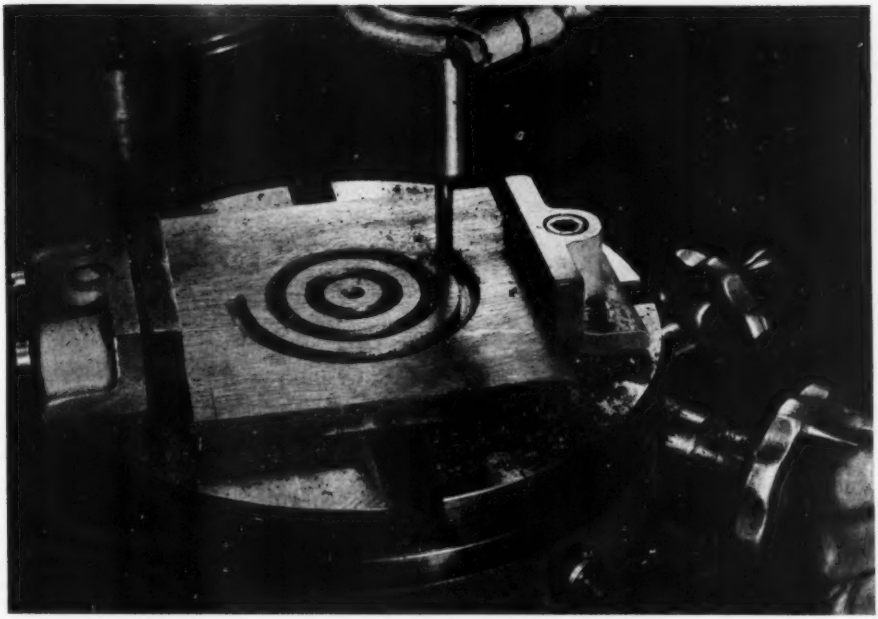
HANGING PLANTER

CANDLE HOLDER



INKSTAND

JEWELER'S BLOW TORCH

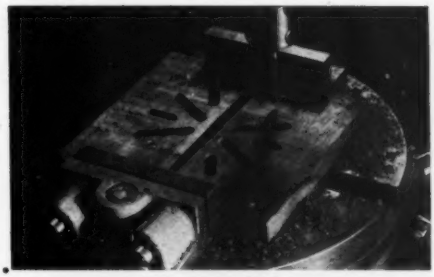


Cutting Grille Designs in Wood

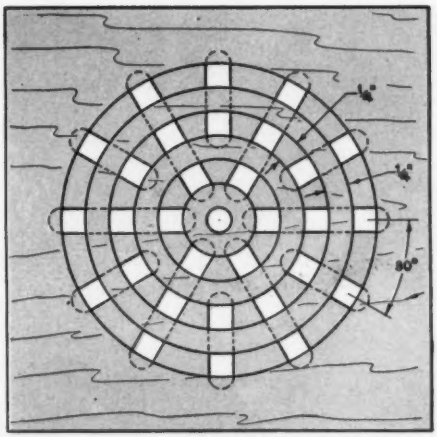
By Walter E. Burton

YOU aren't getting all you can out of a table saw and drill press unless you know the tricks of using them to cut decorative grillwork in wood projects. Loudspeaker openings and vent ports in cabinets are good spots for grilles. They can also be used as decorative touches for a variety of wood novelties.

Straight-line grillwork is the easiest to



GRILLWORK COASTER is a quick job when you use a drill press fitted with a rotary milling table. Increase the radius ½" between cuts, made with a ¼" router bit. The piece is then turned over (upper right) and the reverse side routed in a series of radial cuts. Here the first cut was extended all the way across, but it could have been routed out in two parts, too.



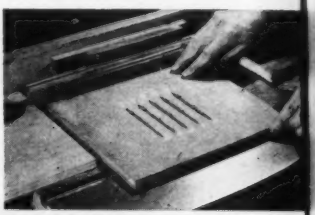
LAYOUT FOR COASTER pictured on the previous page is shown above. Dotted lines show the grooves on back. Spacings are for ¼" router bit.

make. Use a dado cutter on the saw—or the regular blade will do if you want narrow openings.

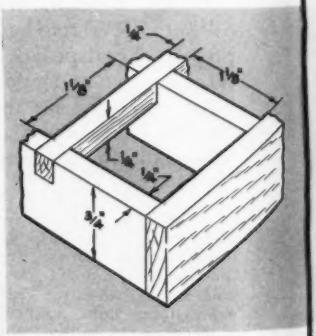
Cutting the grooves. First cut parallel grooves halfway through the wood from one surface. Then turn it over and cut grooves the same depth at an angle to those in the first surface. Openings result where the grooves intersect—square ones if the grooves are at right angles, diamond-shaped ones if the grooves intersect at a slant.

Slide the work along a guiding fence to make straight-line grilles on either a saw or drill press. A useful trick is to employ a number of spacing bars or sticks. You then make the first of a series of parallel cuts with several spacing bars between the edge of the work and the

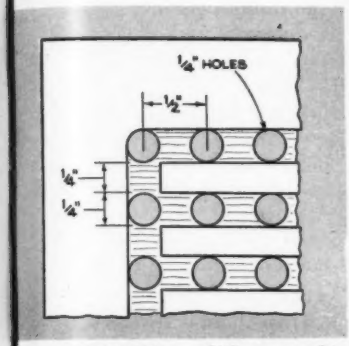
TWO WAYS TO MAKE A HOT-DISH HOLDER are shown below. The one in rear has two sets of dado cuts at right angles to each other.



BOARDS CLAMPED to saw table as above limited forward and backward movement of work while dado cuts were being made. Spacer strips of ¾" wood were placed between the work and fence. One was removed after each cut, spacing the cuts accurately.



DETAILS for reproducing the lattice grille, on which teapot rests at left, are shown in the sketch above.



ONE TOOL, a ¼" router bit, made both grooves and holes in this grille design. The panel was finished by scorching with a gas torch and then shellacking and waxing the surface.

guiding fence. By removing one bar at a time, you position the work for the successive cuts.

Grille-making possibilities really open up when you chuck a router bit in a drill press. You can then cut in curves. These cuts can be made with great precision if the drill press is equipped with a rotary table that has cross and circular feeds controlled by micrometer screws.

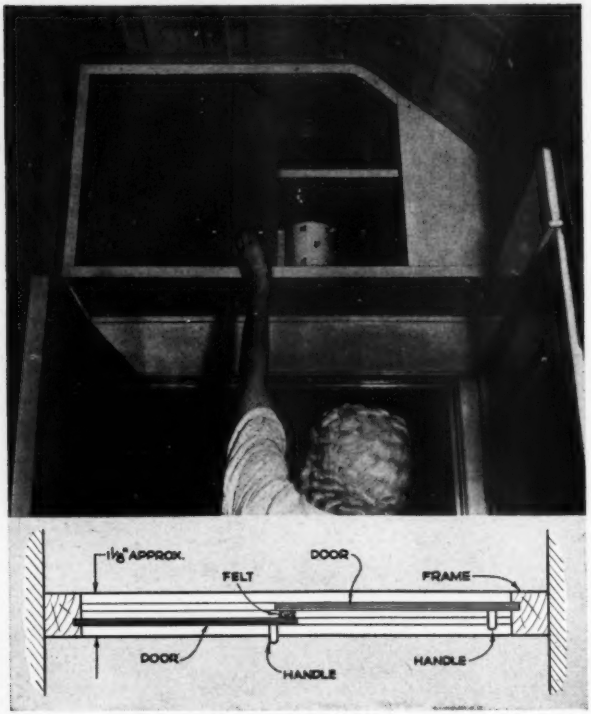
Improvising a table. Circular cuts can be made without such a table, however. Just pivot the work around a nail or screw in a board clamped to the regular drill-press table. Between cuts, shift the work or its support laterally. Bore the center hole afterwards.

Sometimes you will find that the grooves cut on the back surface must take a particular pattern to produce openings that won't cause some of the front-surface detail to be insufficiently supported.

In all cuts, remember that the work must be held firmly and fed carefully and safely to the cutter—and that the cutter should be sharp and operated at recommended speed. Work a strip of abrasive cloth back and forth through the openings to smooth them.

BOOK END above was made with straight cuts of a ¼" router bit in a drill press. The openings were squared by using a wood rasp. END

Cabinet Built Over Doorway Provides Extra Storage Room



IF YOU are cramped for storage space, you can build a cabinet over a doorway, as shown in the photo at left. The bottom and shelf are 1" lumber cut to fit. The door frame and wood cleats screwed to the wall support the pieces. A grooved frame cut from 1⅛" stock takes hardboard sliding doors.

Lampshade Makes Flood Reflector

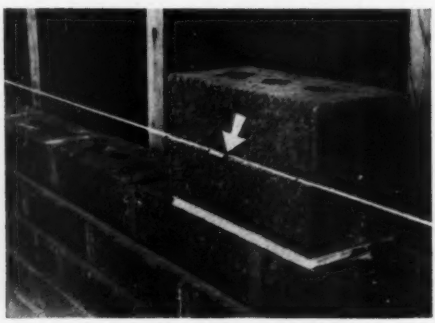
ORDINARY kitchen aluminum foil stretched over a lampshade frame will give you a good photoflood reflector. Strip the old fabric off and cover the back as well as the sides, leaving the socket ring on top open.—*Robert J. Berkvist, Syracuse, N.Y.*

Paper Clips Hold Data Cards

Two paper clips soldered to a ½"-by-2½" strip of tin-can stock make a reading stand for file cards bearing shop data or cooking recipes. Solder the single-loop end of the clips to the strip, drill, and screw it to your file case. The holder will keep the data card off the workbench or kitchen work space.

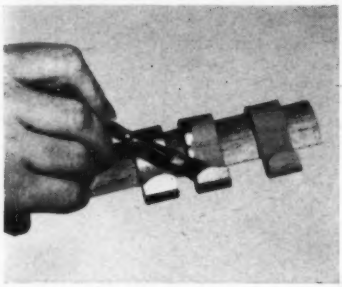
Level Line Kept from Sagging

LONG cords used to lay a level course of cinder blocks or bricks will sag unless supported at the center. You can do this at the height of each course with a matchbook (arrow) held between two blocks, as in the photo. The loose blocks are removed when the course reaches that point.—*Michael Ligocki, Gary, Ind.*

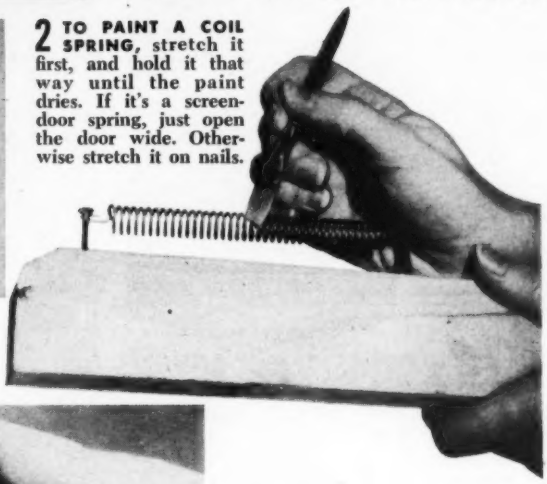


7 Tips for Painters

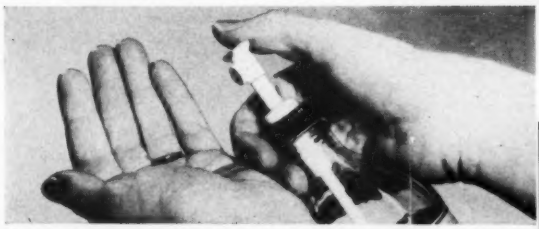
1 AN OPENER bolted to a frequently-used brush saves time. This one was made by hacksawing one leg from a flat corner brace and filing the end to the shape of a screwdriver tip.



2 TO PAINT A COIL SPRING, stretch it first, and hold it that way until the paint dries. If it's a screen-door spring, just open the door wide. Otherwise stretch it on nails.



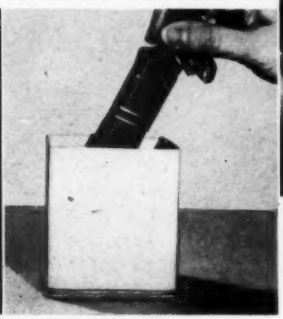
3 PAINT PICTURE HOOKS to match the wall and they'll be less noticeable. For ease in painting, hook them over a scrap of wood.



4 TO CLEAN YOUR HANDS after a painting job, keep the solvent in a pump-type window-spray bottle.

5 AN EGG WHIPPER of the wire-webbed, dimestore type is a fine mixing tool for paint in a gallon can.

6 FOR A SMALL JOB, pour your paint into a cut-down milk carton. Discard it when you're through.



7 SPATTERS COME OFF easily if you coat doorknobs and other hardware with petroleum jelly before you begin to paint. You can also use rubber cement.

Here's an old pressman's trick! Before you start on that next repair or painting job, learn . . .

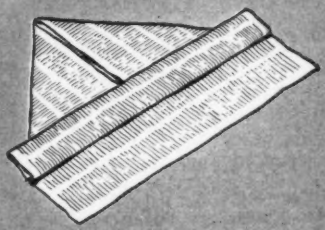
How to Fold a Handy-Man's Hat

WHEN doing any job that makes dirt or dust fly, take a tip from newspaper pressmen and wear a paper hat. Light as a breeze, comfortably snug, and costing not one cent, the hat will keep paint, grease, sawdust and even cold drafts or hot sun off your head. Try one next time you paint a ceiling, clean the furnace or crawl under the car.

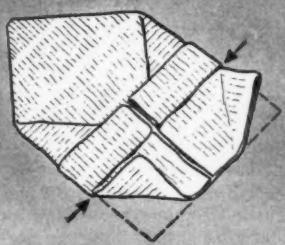
Fold a double sheet of ordinary newspaper as shown in the step-by-step drawings. Once you've caught on, it takes only a minute to make a hat.

For a tighter fit or for a child's hat, make the folds in step 6 closer together. If your community has a tabloid-size news sheet, try it for making midget handy-man hats for the children's pets.

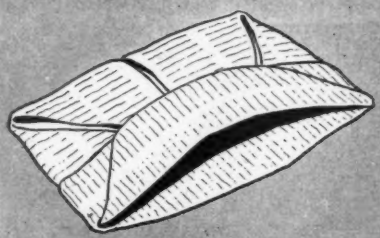
1 **START WITH** a single two-page sheet of standard-size newspaper. Lay it on a flat surface with the fold turned away from you.



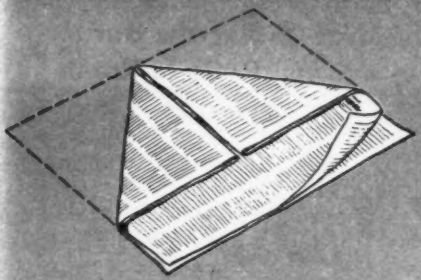
4 **FOLD OVER** the same piece a second time, this time along the line to which you brought the sheet's lower edge in the last step.



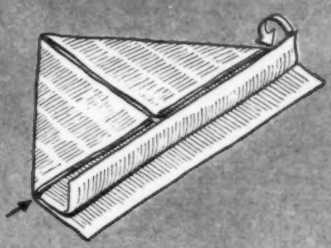
7 **NOW TURN UP** both lower corners to the bottom of the folded band. Crease well, and then, along line marked by arrows above . . .



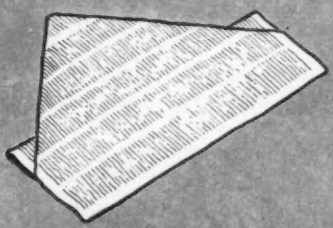
10 **IT SHOULD LOOK LIKE THIS** by now. To make the final square shape, put a hand into the opening, spreading the sides apart like this



2 **TURN DOWN** the two top corners (from the folded upper edge) so that they meet evenly and the lower edges line up at the bottom.

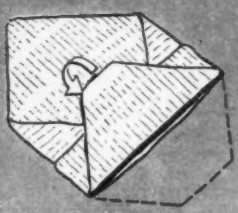


3 **LIFT UP** the single top sheet only, folding its lower edge up to the bottom of the folded corners (arrows). Crease it well.

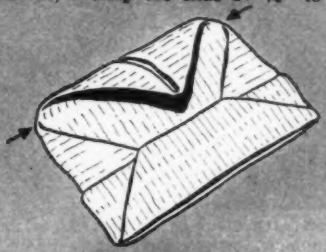


5 **NOW TURN OVER** the whole works, flipping it end for end. The point should still be away from you, as in the sketch above.

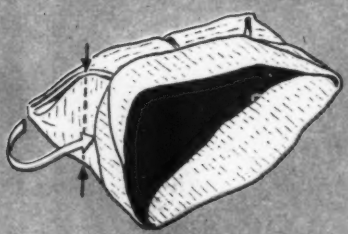
6 **FOLD BOTH SIDES OVER** equally so edges meet. This makes an average size hat. For a tighter fit, overlap the ends by ¼" to ¾".



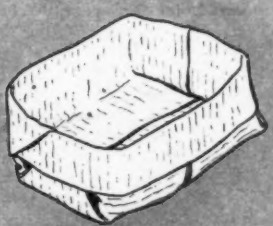
8 **FOLD THE BOTTOM UP** right across the band, crease, and tuck it around and under the band as indicated by the curved arrow.



9 **THEN FOLD THE TOP DOWN,** creasing it in line with the two arrows to form sharp corners at both ends. Tuck it under the band also.



11 **OPEN ONE END WIDE,** push a crease in with a thumb along the vertical arrows, and fold the point down, tucking it behind the band.



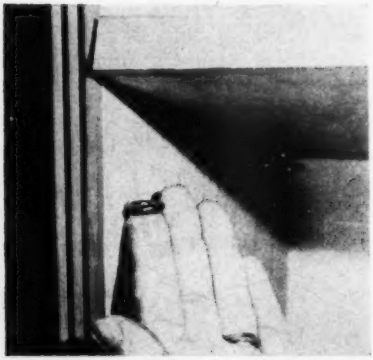
12 **REPEAT STEP 11** at the other end. Then lay the hat upside down on a flat surface and crease the corners square on all four sides.

Barrow Burner Rolls to Trash

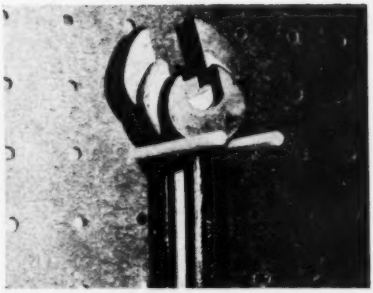
GARDEN refuse and leaves can be burned on the spot in a receptacle made of fence wire and fastened on a metal wheelbarrow.

Shape the wire to fit the flat bottom of the barrow. Fasten it with wire run through holes drilled in the barrow below the lip.—*Bill Arter, Worthington, Ohio.*

DO IT THE EASY WAY



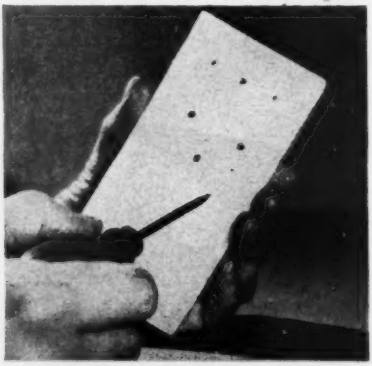
INSTALLING AN EXTRA SHELF in a kitchen cabinet? Just rest each end on screw eyes.



NEED A BRACKET for hanging a wrench set on a perforated panel? Use dowels.

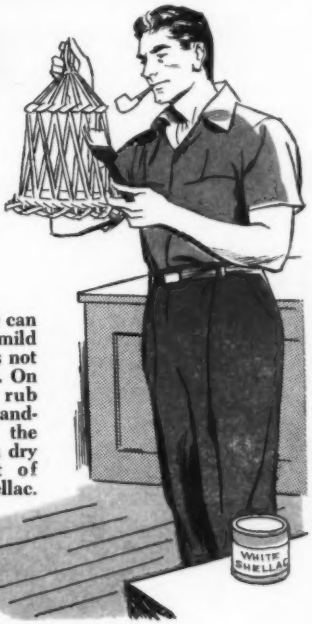
LOOKING FOR A FLOWER FROG for an odd-sized bowl or a vase? Make it from wax. Punch holes with a hot awl or pick.

WANT TO SPACE HOLES in a line exactly 1" apart? Use a strip of perforated hardboard as your gauge. A punch will fit the board holes for accurate centering.



Keeping the Home Shipshape

A SNACK BAR for your kitchen is right at hand if you have a sit-down ironing board that allows space for the knees. Cut a plastic cover to match the contour of the board and ask the seamstress in the family to sew on a stiff quilted border to serve as an apron.



WICKER AND REED can be cleaned with mild soapsuds if dirt is not deeply embedded. On stubborn spots, rub lightly with fine sandpaper. To keep the piece clean, when dry give it a coat of thinned white shellac.

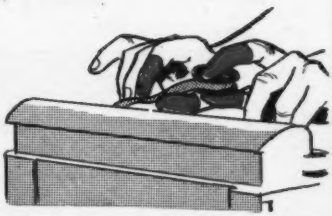
A LINOLEUM CUTTER can be made by notching the end of a good putty knife. You'll find that it does a better job than an ordinary knife when you have to cut around pipes, sinks and other floor-based objects.

STOP SNAGGING CLOTHING inside clothes chutes and wooden laundry hampers. Sand down all rough edges that clothing might touch, and then polish with a good brand of paste wax.

Please turn the page for more home tips

More Home Tips

FAT LITTLE PIGS like this one pep up an Easter table or a youngster's basket. Cut off the points of chicken-corn candy for ears and snout, and use the flat ends for feet. Cement the candy and a pipe-cleaner tail to a tinted egg, and draw the eyes with a crayon.



CHANGING A RIBBON on a typewriter doesn't have to be such a messy job. Next time you discard an old pair of rubber gloves, cut off the thumbs and first fingers and keep them handy just for this chore.

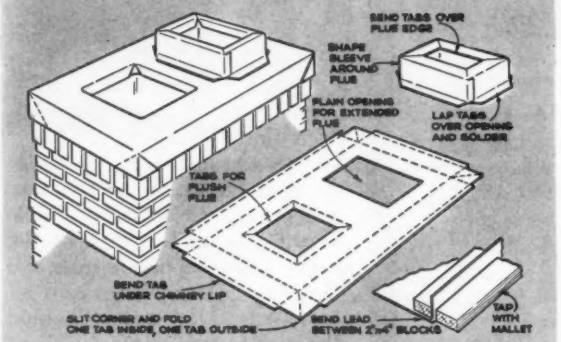
GLASS SPLINTERS that are too tiny for a broom to pick up can be wiped up with a couple of dampened facial tissues.

BELTS WON'T TANGLE in drawers or gather dust in closets if stored in plastic sandwich boxes or cheese boxes. You can stack the transparent containers so it's easy to pick the belt you want in a jiffy.

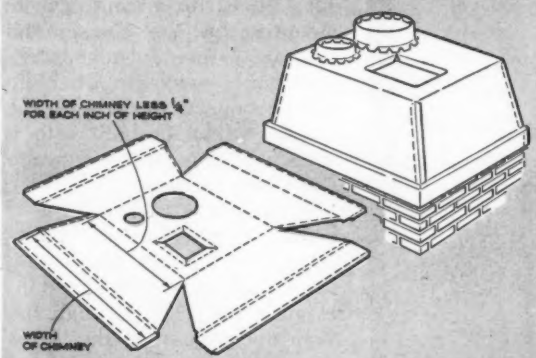
THERMOSTAT CLOCKS sometimes develop a noisy purr or rattle. Running a vacuum-cleaner brush attachment over the works will remove grit and dust that may be causing the trouble.

TO KEEP OUT DAMPNESS, wind and rain at a cellar hatch, fix a sponge-rubber floor mat to the underside of the outer door. Fasten the mat to the wood with roofing-paper nails and metal disks, letting it extend 4″ to 6″ beyond the bottom of the door. This overlap folds down, sealing the door tightly when closed.

Lead Cap Stops Chimney Leaks


BEND TABS OVER FLUE EDGE
SHAPE SLEEVE AROUND FLUE
PLAIN OPENING FOR EXTENDED FLUE
LAP TABS OVER OPENING AND SOLDER
TABS FOR FLUSH FLUE
BEND TAB UNDER CHIMNEY LIP
SLIT CORNER AND FOLD ONE TAB INSIDE, ONE TAB OUTSIDE
BEND LEAD BETWEEN 2"x4" BLOCKS
TAP WITH MALLET

LAY OUT PATTERN from a paper template. Where flue tiles are flush with the top, bend tabs down inside. On tiles that extend above, solder on separate sleeves.



IF FLUES STICK UP too high for good appearance, you can shape a decorative cap around them. Build up a form of bricks and mortar to back up the soft lead.

THOSE handsome metal chimney caps, long used on expensive homes, are easy to add yourself if you use sheet lead. Lead gives a trim, rich look and protects a masonry cap from becoming cracked and weathered, causing leaks that are often difficult to find and expensive to repair.

You can snip the soft lead with metal-cutting shears and shape it easily. Lay out a pattern on heavy paper and make sure that it fits the chimney. Use either three-pound hard lead or four-pound soft lead, available at many plumbing stores and metalworking shops, and from roofing-supply dealers.

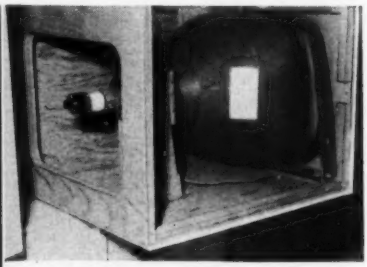
Solder or weld as many of the joints as you can before hoisting the cap to the roof. Any joints that must be made later can be pretinned and sweat-soldered with a small gas torch after the cap has been placed on the chimney.

Bend the lower edge under the chimney lip to hold the cap on. If there's no lip, you can bolt an angle-iron cleat around the chimney with masonry anchors. Bend the cap under it.

Three Methods of Mounting a TV Set

TABLE-MODEL TV sets often become orphan pieces of furniture which are just stuck anywhere that you have something to put them on. Frequently they take needed space from other furniture, interfere with room arrangement, or aren't placed in the most advantageous viewing spot.

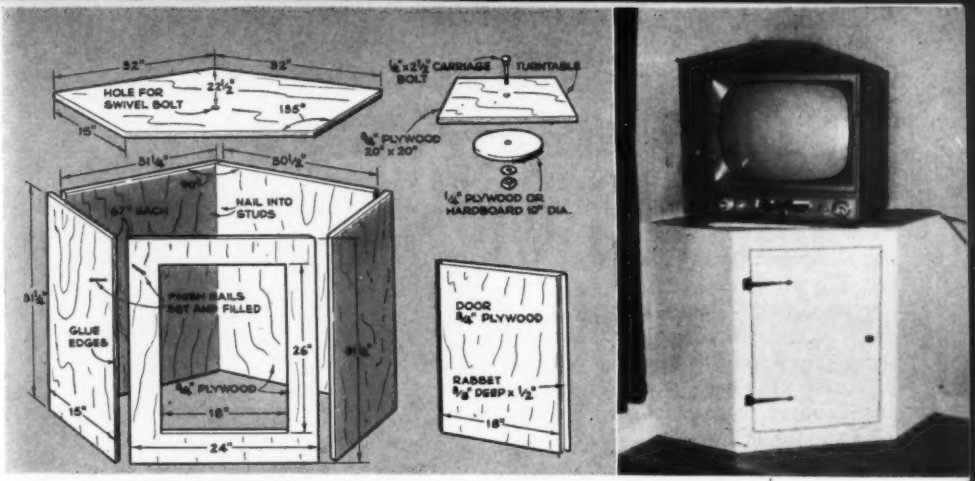
Here are three ways that you can make a table set stand on its own feet—literally by building a stand for it, or by concealing it in a wall cabinet.



1 **This hinged tube,** built into a separate plywood box, swings out for comfortable viewing from any part of the room. The rear of the tube and the deep cabinet for record albums extend into a closet behind the wall to save space.

The pivoted tube was devised by Don T. Thurow of Kalamazoo, Mich., to permit remote mounting of the chassis and controls. A standard tube-extension cord, available at radio stores, connects the tube to the chassis, which is built into a matching cabinet on the opposite side of the doorway.

A two-piece, piano-hinged folding door closes the upper half of the cabinet, eliminating a right-hand door that would interfere with traffic through the room doorway when the TV is in use. Fluted molding strips are tacked to the door faces to form a decorative design and to the plywood shelf edges.



2 **A corner cabinet** puts your set where it can be seen from the greatest number of angles and uses space that's often wasted. The added swivel lets you turn the set in any direction. You can use the lower part to store bulky appliances, such as a vacuum cleaner, or fit it with shelves.

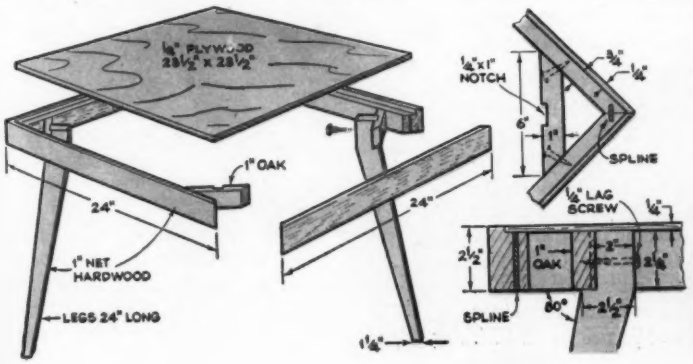
The dimensions shown will take up to 21-inch sets, with plenty of clearance for swiveling. For larger sets, add 4" to the width of the two back pieces and 2" all around to the turntable top. If you have a baseboard, cut the back pieces shorter by its height and rest them on top. Remove small moldings so that the pieces will sit flush on the floor.

The turntable is a 20" square of ¾" plywood that rotates on a large washer cut from thin plywood or hardboard. I mounted the door with black forged strap hinges and painted the cabinet with white enamel to match the woodwork.— *V. H. Lamoy, Upper Jay, N. Y.*

3 **Here's a TV table** that's easy to build, yet has the look of a fine piece of furniture. The side pieces and legs are made from 1" (actual thickness) hardwood. Use walnut or mahogany to match a dark cabinet, or birch for a blond one. Since you don't need much, you can get the beauty of good wood at little cost.

The frame is rabbeted to take a ¼"-plywood top of matching veneer. Diagonals at the corners support the legs and also the main weight of the set above. To join the splined corners, cut the miters first, then slot the ends ¼" wide and deep to take ¼"-by-½" plywood splines.

The table shown is for a 21" set. For others, you can adjust the dimensions to suit, but keep the same height. For a decorative edge, cut a shallow saw kerf all around the assembled frame 1" below the top. Finish the wood with lacquer or shellac.—*Hi Sibley, Nuevo, Calif.*

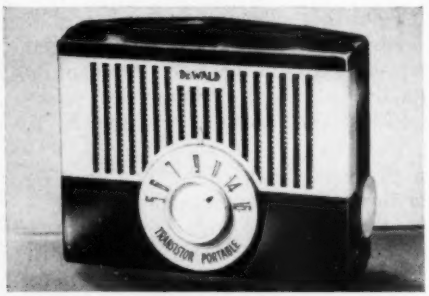


New in Electronics

1. Computer in Kit Form. Now you can build even an electronic brain from a kit. For $700 you get parts for this analog computer, a super slide rule that can solve real industrial and research problems, saving many hours of calculation or experiment.

It includes 30 coefficient potentiometers that can be set to better than 1/10 of 1 percent accuracy, a 13-tube drift-canceled power supply, a nulling meter for accurate voltage setting. A patch board shows the block layout that is set up.

The cabinet houses 15 three-tube DC amplifiers. The meter can be switched to any of these, and set for full-scale deflection of plus or minus 2, 20 or 100 volts.



2. Home Battery Portable. This six-transistor superhet (above) has a push-pull audio output stage and a 4″ speaker. List-priced at $60, the compact receiver is designed for room-to-room as well as outdoor use. Its single 9-volt battery is said by the maker to afford a full year's use, costing less than house current for operation.

3. Midget Transistor Set. Packing a transistor circuit into its 3½″-by-5¾″ nylon case, this midget is said to have 100 milliwatts of undistorted power output. Four pen cells power it. It's priced at $75.

4. Rectifiers Go Tubular. New selenium rectifiers for high-voltage, low-current jobs (photo below) range from ⅛″ to ½″ in diameter. Rated at from 1 to 20 ma. per cell, they come with pigtails or fuse-clip ferrules. Power rectifiers in the familiar square shape (not shown) now have rounded corners to keep protective coatings well sealed and to provide added safety in handling.

Further information on the products above can be obtained from: 1. Heath Company, Benton Harbor, Mich.; 2. DeWald Radio Mfg. Corp., 35-15 37th Ave., Long Island City 1, N.Y.; 3. Zenith Radio Corp., 6001 West Dickens Ave., Chicago 39; 4. Union Switch & Signal, Pittsburgh 18, Pa.

How to Build a Hold-a-Phone

It listens while you're busy, calls when your party returns, even lets the family eavesdrop.

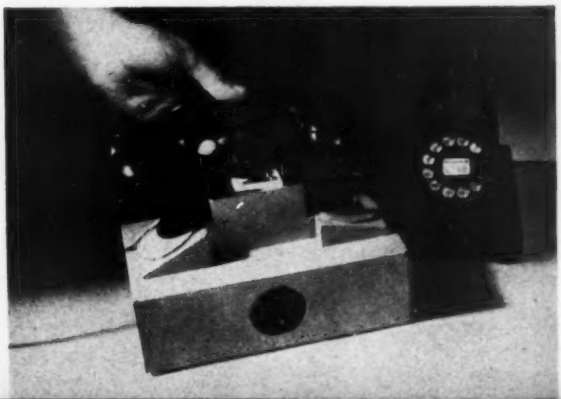
A LOUDSPEAKER SIGNALS when someone comes back on the wire. While waiting for this signal, it is possible to take a cake out of the oven or handle other chores that are near at hand.

By Howard G. McEntee

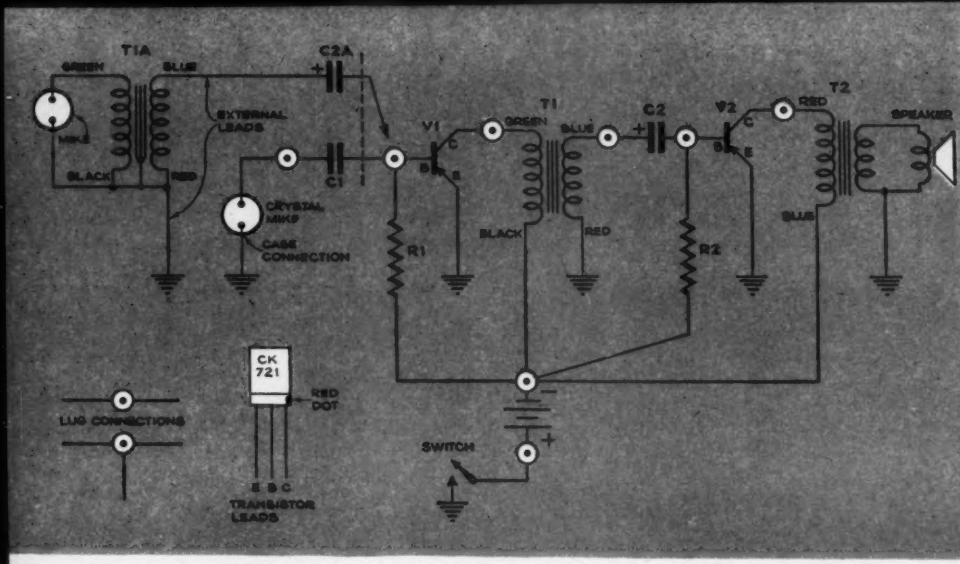
NOBODY has to be chained to the telephone when asked to hold the line. This little transistor unit will patiently listen to that silent receiver—and sound off the moment the other party comes back on the line or a long-distance call comes through.

It will do more than that. Need both hands free to take down a long message? Want the whole family to hear Grandma's holiday call from across the country? Place the handset on this rig, and everything in the receiver can be heard across the room.

With one extra transformer, the microphone can be placed a hundred feet or more away from the speaker. That makes it a one-way intercom or baby sitter. Any cry from the cradle will be relayed to the bridge table or even way down

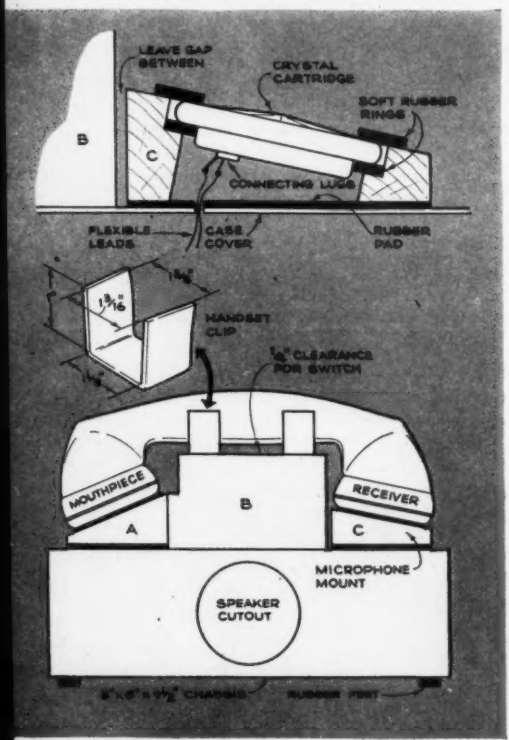


DROP ON THE HANDSET, and this transistor rig will listen for and relay any sound in the receiver. As shown here, it is built for a left-hand user. If you usually hold the handset in the right hand, the speaker should be mounted on the other side.



IDENTIFY TRANSISTOR LEADS from the red mark at the collector end. Six of the ringed dots in the diagram represent the strip lugs, the other two dots the battery-case or cell terminals.

CUT BLOCKS to suit your own phone. Bend the clips to an easy fit so that full weight of the instrument lies on the switch and rubber pads. Connect the mike with thin flexible wires.



to your basement workshop, if you wish.

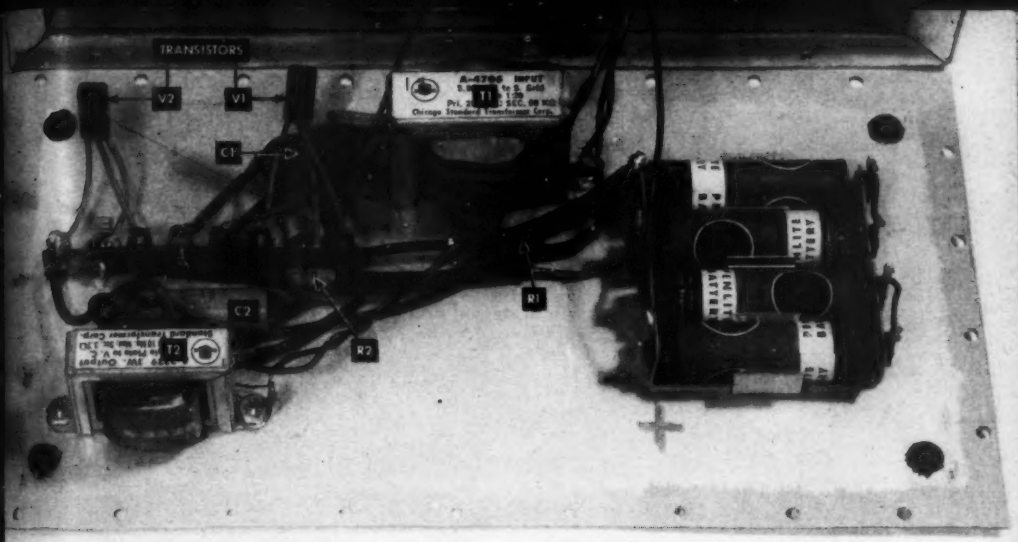
Batteries last and last. The rig is a two-transistor audio amplifier, with a microphone to pick up the sound from the telephone receiver, and a speaker to relay it at boosted volume. There is no power cord to plug in; the outfit is powered by four pen cells inside, and turns on automatically when the handset is set in place.

So low is the current drain that the dry cells would last hundreds of hours even with the switch left on. Therefore you can solder them right into the circuit if you like, saving the cost of a battery case.

Both mike and speaker can be inexpensive. If you are willing to experiment, cheaper transistors might be used, but it may then be necessary to experiment with different values for some parts. Be sure, too, to watch battery polarity. The CK721's specified are PNP's; with NPN's, the battery and electrolytic condenser would have to be reversed.

All parts, including the specified transistors, are available separately or can be bought as a kit.* Instead of the metal chassis shown, you can use a cigar box

**Parts available separately or in kit form from Federated Purchaser, Inc., 1021 Route 22, Mountainside, N.J.*



CHASSIS LAYOUT is simple, and there is ample room for the extra mike-matching transformer if desired. Battery holder can be dispensed with if leads are soldered directly to cells.

or homemade case. A suitable speaker might be salvaged from an old portable or table radio to reduce the cost.

Three wooden blocks, shaped from a two-by-four, support the hand rest on the switch and position its receiver over the microphone. Hold your own hand rest with the middle or grip section horizontal above a level surface, and cut cardboard wedges to fit under both ends. Use these wedges as patterns to cut the end blocks, which will probably be different in size and shape.

Rubber seals out noise. Sound leakage must be held down to prevent feedback. This is what happens if the mike picks up outside noise, sending it to be boosted by the amplifier. It will come out louder from the speaker, re-enter the mike, be amplified again and again, and wind up as a howl or whistle. Therefore blocks A and C must fit the handset closely, and block A should have a soft foam-rubber disk (cut from a rubber powder puff) cemented on top of it. Block C (under the receiver) has to be cut out to fit the amplifier mike.

This requires a round hole of two diameters, which form a step or rabbet in which the mike cartridge lies. Cut the top face of the block to the required angle, but make the hole before cutting the rest of the block to size or it may split. Set a circle cutter or expansion bit to the larger diameter, bore ¼″ deep with the bit at 90° to the sloping surface, reset to a smaller diameter, and continue through as in the drawing.

If you have no adjustable bit, jigsaw the hole somewhat larger than the outside of the cartridge, and glue a cardboard strip around inside to build up a rabbet.

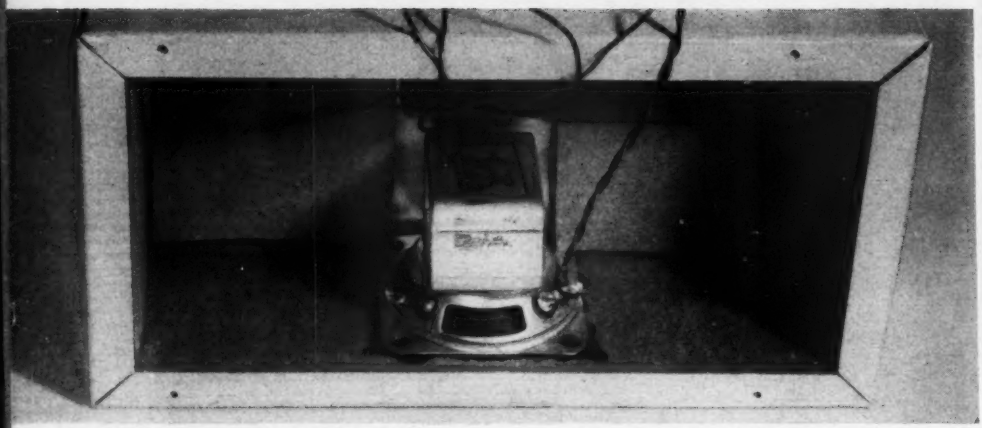
Cement a ring of rubber into this, set in the cartridge, and glue a larger rubber ring outside to retain it and form a sealing cushion for the receiver.

Instead of screwing the mike block to the case, cement it on with a rubber pad between. Cut block B a trifle short so that it does not touch block C.

The switch. This is two strips of spring brass mounted on the center block with

PARTS LIST

T1, T1A: Mike-to-grid transformer (Stancor A4705)
T2: Output transformer (Stancor A3329)
Microphone: Crystal mike replacement cartridge (Shure Model R7)
Speaker: 2″ permanent-magnet type (Oxford 2AM5)
V1, V2: Raytheon CK721 transistors
C1: .01 mfd. ceramic
C2, C2A: 5 mfd., 8 volt midget electrolytic
R1: 1-megohm carbon
R2: 75,000-ohm carbon
Misc: one 6-lug strip, 4 pen cells, battery holder (optional), chassis or box, metal for chassis bottom, guide clips and switch, sponge rubber, soft sheet and sponge rubber spaghetti, hookup wire, etc.



SOUND-ABSORBING LINING inside the case helps reduce feedback. Fiber acoustic board or thick sponge rubber will serve. The kind of cement used to hold auto weatherstripping will hold it to the case securely. The speaker is cemented to the lining, not fastened to the case.

wood screws so that the handset will press the upper one into contact with the lower. Shape the guide clips from strap iron or aluminum and line them with felt. Make certain that the switch is not stiff and that the clips do not pinch the handset, for as much of its weight as possible should lie on the rubber pads.

The entire case must be lined with sound-absorbent material. Pieces of a sponge-rubber kneeling pad will do. Attach them to the top and four sides of the interior with heavy-duty rubber cement.

Cut a hole in one side of the case for the speaker, and a matching hole in the lining for that side. Cement a disk of fine-mesh screen behind the hole in the case, attach the rubber lining, and cement the speaker to the rubber.

Wiring the amplifier. One six-lug strip serves for most of the connections and as transistor mounts, no sockets being used. Solder all else before attaching the transistors, which heat may damage. Leave their leads long, slip on tubing, and solder quickly with a hot iron.

Two lugs on the strip hold it to the base and serve for some of the ground connections. Put a ground lug under one mounting screw of each transformer.

A howl may be heard if the contacts are closed by a finger, but it should stop when the handset covers the mike. If it continues, make sure that the seal fits the receiver, and that the speaker is not touching the case anywhere. If all else fails, the overall gain may be too high; lower it by increasing the resistance of R1.

How to boost sensitivity. The mike is badly mismatched to the first transistor. You can boost volume by coupling it through an extra transformer, preferably one like T1, though any 1:3 audio transformer might be used. Break the circuit between C1 and R1, and connect the low-impedance winding through a second electrolytic condenser like C2 directly to R1.

This matches the mike to the transistor better, and is the setup needed for remote pickup. Mount the extra transformer right on the remote mike.

Feedback can be used to make the rig a code-practice outfit. Stand a book in front of the speaker, shifting it about until you get a clear note. END

HINT TO AN UNHANDY HANDY MAN

Doing odd jobs
With a twist of the wrist,
Is second nature
To the hobbyist.

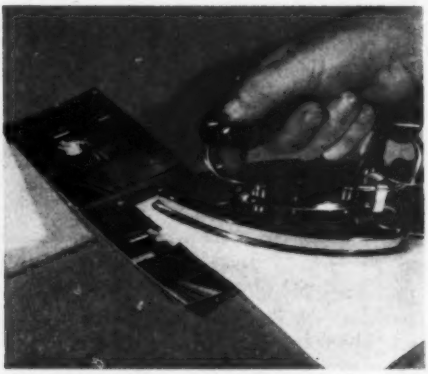
—HUGH LINEBACK

4 Photo Tips

1 HOMEMADE LENS CAPS take only a few minutes to assemble this way. Tape a strip of corrugated cardboard around the lens barrel (upper photo). Then tape a plain cardboard disk on top, followed by a paper disk pasted on to hide the tape. Paint the cap black.

2 HARD-WATER SPECKS that settle on your subjects' noses can be eliminated by rinsing the negatives for a minute or two in a weak solution of acetic acid—half an ounce in a quart of water. The acid dissolves the lime in hard water that often dries on the film, producing a haze or spots on the negative.

3 RESTORE LENS MARKINGS by brushing on thinned shellac and rubbing white chalk into the engraved depressions. Quickly wipe off the excess shellac and chalk. The crisp white outlines will remain glued in the grooves.

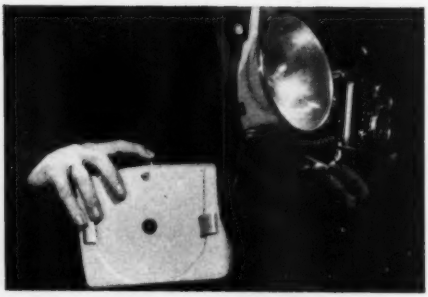


4 PHOTOGRAPHIC BLOTTERS are both useful and decorative for friends. Cut small blotters from large sheets, iron on the prints with mounting tissue, using a protective pad. Make your prints on matte paper, which won't crack.

New for Camera Fans

1. Accessory Adjusts for Parallax. This Japanese-made twin-lens automatic reflex camera has as a low-cost accessory an attachment that adjusts for parallax. It helps you shoot, at close up, the picture that you see on the ground glass. Called a Parajuster (circled in photo), it fits the bottom of the Minolta Autocord (and other reflexes having lenses 1¾" apart between centers). You focus with the bed closed; then open it and the photographing lens is automatically raised to the former position of the picture viewing lens.

Priced in the U.S. at two-fifths the cost of most precision reflexes, the Minolta has a top speed of 1/400 sec., F/3.5 coated taking lens, and built-in flash and strobe synchronization.



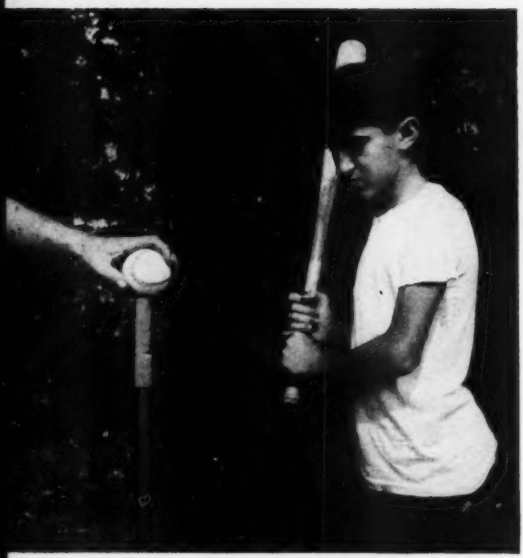
2. Electronic Flash. Equipped with a permanent-type flash bulb and a power pack, a new flash outfit will also operate on 110-volt AC. Life of the bulb is estimated at more than 1,000 flashes; that of four flashlight D batteries in the pack at 200 to 300 flashes. Using house current wherever it is available saves the batteries for flash on outdoor shots.

3. Photos Printed on Metal. Sensitized aluminum sheets are available for ordinary darkroom printing of your favorite negatives. Prints made on them can be cemented to novelty ash trays, coasters, personal jewelry and other items.

Further information on these photographic products can be obtained from: 1 and 2. FR Corp., 951 Brook Ave., NYC 51; 3. Metalphoto Corp., 2903 E. 79 St., Cleveland 4.

New Film Blows 'Em Big

NO ELEPHANT'S eye, this bigger-than-lifesize peeper is one of the pair that you see in the little picture at the upper left. The eye is a 30-times enlargement from the original 35-mm. negative, shown in actual size by the small photo. The picture was made with a new super-fine-grain film, an updated version of Kodak's Panatomic-X, now available in 35-mm. magazines and 828, 127, 120 and 620 rolls. The secret? Especially fine particles of silver in an extra-thin emulsion distribute light so evenly that details remain crisp, texture smooth.

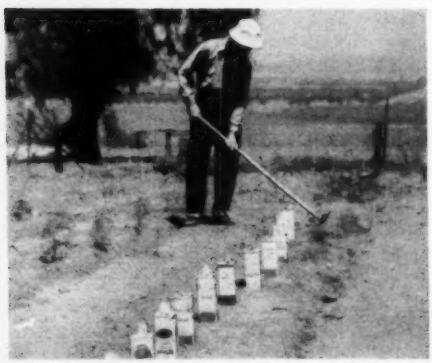


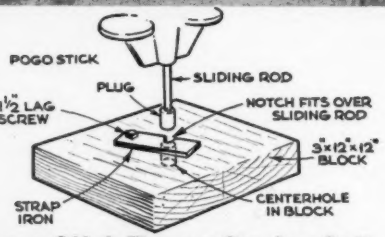
Trainer for Young Babe Ruths

You can rig up a baseball batting tee for your youngster by slipping an 8″ piece of rubber hose over one end of a 42″ length of broomstick. Push the other end of the stick into the earth until the baseball rests on top at batting level.—*Lew Byrnes, Woodhaven, N. Y.*

Cartons Protect Young Plants

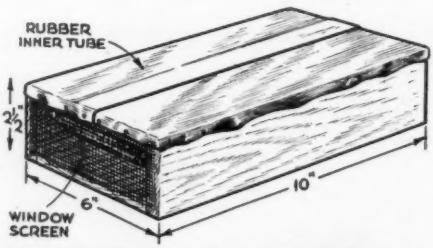
A good way to keep young, tender plants free of insect pests is to cover them with milk cartons from which the bottoms have been cut off. You can open the caps on sunny days or for spraying, and close them on cold nights.





Pogo Stick Tamps Garden Soil

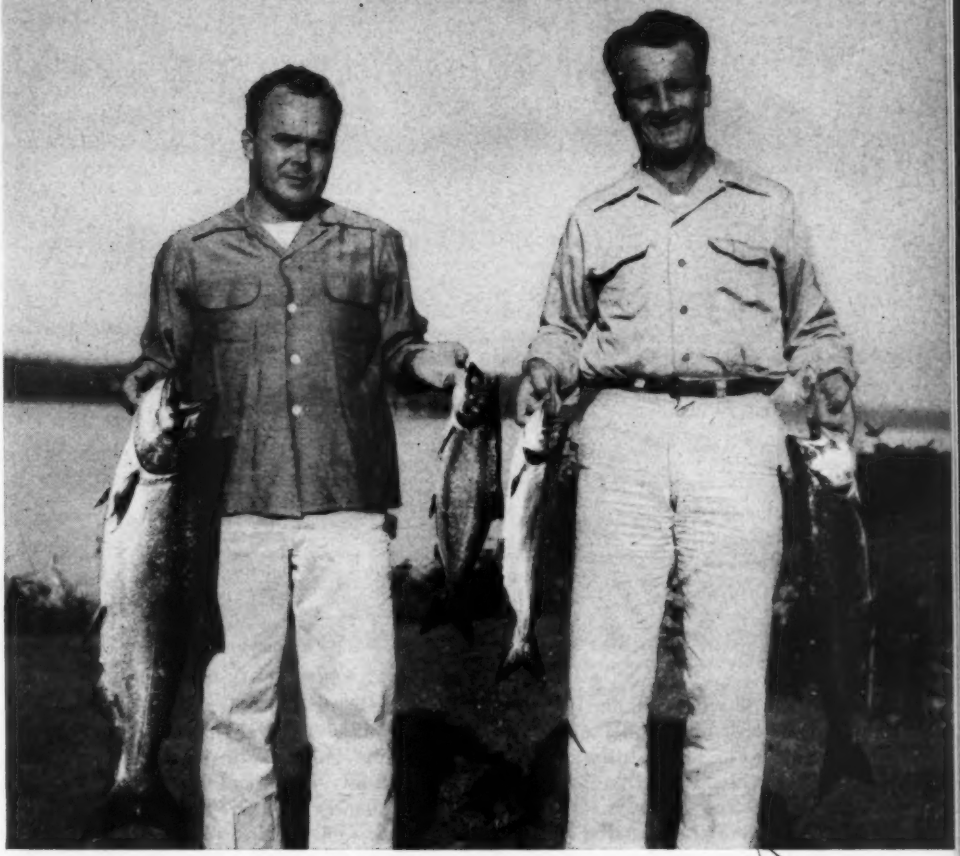
A pogo stick on a wood block will give you a spring-loaded tamper that's fun to use. Drill a 1″ center hole in the block deep enough for the sliding-rod plug. Then notch a 4″ length of strap iron and attach it over the hole with a single lag screw, so that it will swing over the rod and hold the plug. You can remove the stick when it's wanted for pogo.—*Scott J. Saunders, Plainview, N. Y.*



How to Make a Live-Bait Box

I made a 2½″-by-6″-by-10″ box for grasshoppers, crickets and similar live bait out of orange-crate stock, a scrap of window screen and a piece of inner tube. The ¾″-thick crate ends (½″ stock would also do) were used for the sides and bottom. I tacked screening to the ends and two overlapping strips of inner tube to the top. The bait is reached through the flexible overlap.—*Thomas P. Ramirez, Fond du Lac, Wis.*

We Make Our Own Glass Fishing Rods



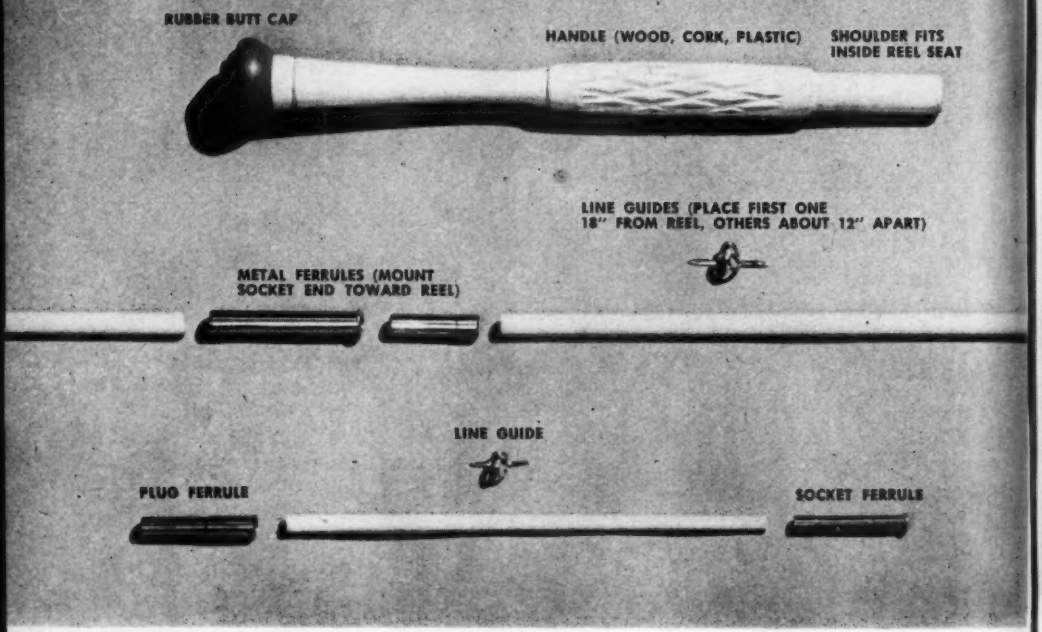
By Phil McCafferty

DID you know that it's possible to *make* one of those new glass fishing rods? I didn't either until my brother Bud and I priced them—and found that we could buy parts and assemble three big salt-water poles for the $100 tag on a single one ready-made.

Those handsome salmon in the picture above are edible proof of what our homemade rods will do. That's Bud at the left, me at the right. We caught the salmon in Washington's Puget Sound.

You buy glass-rod blanks in the length and thickness needed for the type of rig that you want. Parts for salt-water rods like ours

How to assemble the parts to make your own glass rod


RUBBER BUTT CAP
HANDLE (WOOD, CORK, PLASTIC)
SHOULDER FITS INSIDE REEL SEAT
LINE GUIDES (PLACE FIRST ONE 18" FROM REEL, OTHERS ABOUT 12" APART)
METAL FERRULES (MOUNT SOCKET END TOWARD REEL)
LINE GUIDE
PLUG FERRULE
SOCKET FERRULE

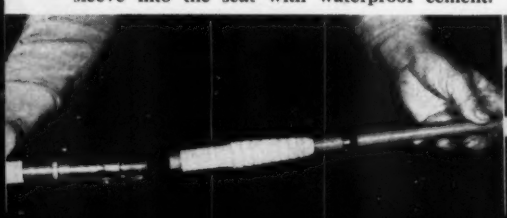
cost around $30. For smaller bait-casting and other fresh-water rods, you can get the whole works for as little as $7.

It's fun, too. When you make your own rods, the only limit is your imagination. You can lathe-turn the handles to your own design or choose from scores of ready-made handles.

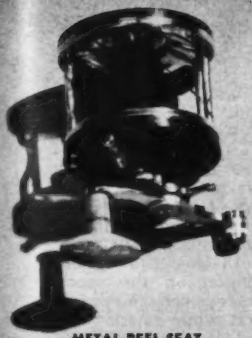
The handle is cemented into one end of a metal reel seat and the pole is cemented into the other end. The only job that takes a little knack is winding on the line guides. The jig shown on page 216 holds the spool of thread, freeing your hands so that you can make neat, professional-looking windings quickly.

Glass is tough. The spun-glass rods are so strong and springy that you can bend the thin ones double and they'll snap right out straight again. They can't

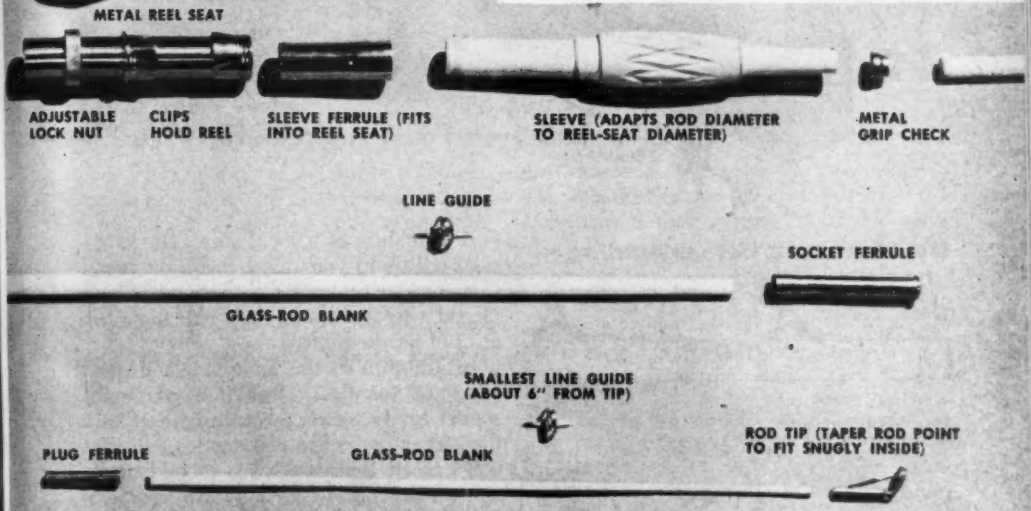
TO ATTACH HANDLE, this turned wood sleeve is shouldered to fit into the hollow metal reel seat. The pole is glued into the sleeve and sleeve into the seat with waterproof cement.



USING HOLLOW-TYPE FERRULES makes it easy to get tight joints between sections. Slide ferrules on the pole until they jam, then back off ferrules and hacksaw the rod at those points.



LAYOUT OF PARTS shows a typical glass rod, divided into sections for easy portability. Rod here does not represent actual dimensions, but shows how the fittings are arranged. Cut the sections first so that the line guides can be staggered to miss the joints. Biggest guide, near reel, should equal rod's diameter at its thickest point. Succeeding guides become smaller toward the tip and are closer together. Space them from about 12" down to 6" apart.

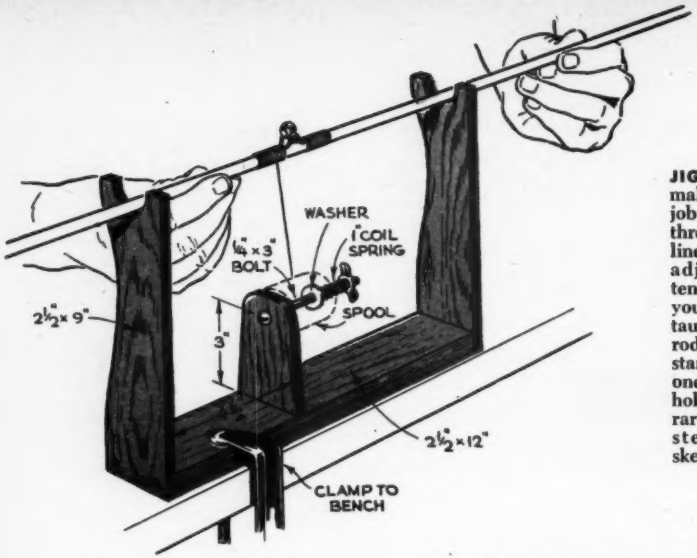


rot, rust or deteriorate. They're not affected by salt water or heat and cold.

How does glass get this way? It's something like the difference between a brittle steel rod and a tough, flexible cable. Fine spun-glass fibers that have a tensile strength greater than steel piano wire are woven into cloth, and the cloth is wrapped in layers around a slim, tapered mandrel. A plastic bonding resin impreg-

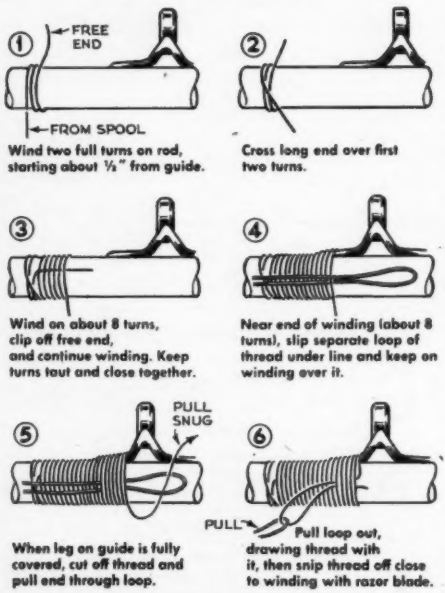
STICK CEMENT, heated over a candle, is used to glue on the ferrules. You have to work fast —the cement hardens quickly. The rod can be shaped slightly with a file or sandpaper.

YOU CAN MAKE OR BUY a variety of handles like these to suit any type of rod. If you get one that has a collet chuck (at top), be sure that the rod will fit the chuck opening.



JIG BUILT OF SCRAP makes a quick, neat job of winding on the thread that holds the line guides in place. By adjusting the spring tension on the spool, you can keep the thread taut while rotating the rod in the cradle. To start a winding, tape on one leg of the guide to hold it in place temporarily, then follow the steps shown in the sketches (below left).

How to wind a tieless binding


1
FREE END
FROM SPOOL
Wind two full turns on rod, starting about ⅛" from guide.
2
Cross long end over first two turns.
3
Wind on about 8 turns, clip off free end, and continue winding. Keep turns taut and close together.
4
Near end of winding (about 8 turns), slip separate loop of thread under line and keep on winding over it.
5
PULL SNUG
When leg on guide is fully covered, cut off thread and pull end through loop.
6
PULL
Pull loop out, drawing thread with it, then snip thread off close to winding with razor blade.

nating the cloth supplies the resiliency.

Buying the parts. Many sporting-goods stores stock a full range of rod blanks and supplies. Rod hardware is available by mail from Montgomery Ward. You can also order supplies from the places where we bought ours.*

**The Yakima Hardware Co., 116 E. Yakima Ave., Yakima, Wash.; and Herter's, Inc., Waseca, Minn.*

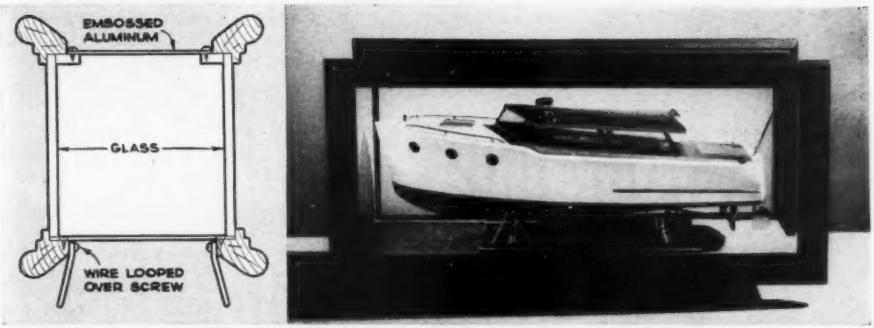
If you shop at a local store, the salesman will help you select the right parts. If you order by mail, tell them what kind of rod you want and they will make up a set of hardware to fit.

In addition to the handle, you'll need a set of ferrules. These are plug-and-socket connectors that are cemented onto the cut ends of the rod sections so that you can fit them together or take them apart easily. Rods from 6′ to 8′ long are usually divided into two sections; over 8′, three sections. As a general rule, the fewer the sections you can use, the stronger the rod will be.

You'll also need a set of line guides, about one to each foot of rod. When you lay out the guides, space them slightly closer as they progress toward the tip.

Assembling the rod. Mount the handle first to find the rod's overall length before cutting it into sections. The ferrules may not fit snugly at points that will make the sections come out exactly equal in length, but a difference of several inches doesn't matter. It's better to have tight-fitting ferrules than precisely even lengths. You can whittle the rod down a bit to fit a ferrule, but never try to shim it up—the ferrule will work loose.

To bind on the line guides, special nylon winding thread is available in many colors. Use size A for slim light fly rods, E for medium-sized rods, and heavy EE for the big salt-water rigs. **END**



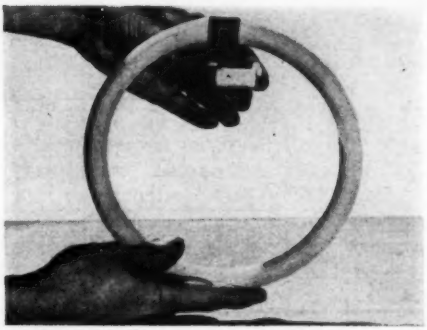
Picture Frames Make Attractive Case for Model Display

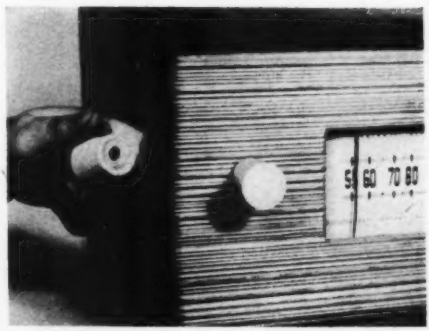
To MAKE a display case for a model, I used two picture frames, four sheets of embossed aluminum, two pieces of glass, and legs bent from stiff wire.

Three aluminum sheets were screwed to the bottom and side rabbets; then the glass was held in place in the top rabbets with plastic cement. The aluminum lid was screwed to two projecting strips of wood also cemented in place, as shown in the drawing. I painted both frames a flat black.—*Gus Hall, Brooklyn, N.Y.*

Ring-Toss Game Is Made from Rubber Hose and Bits of Dowel

CHILDREN will be entertained with a set of quoits you can make from rubber hose and doweling. Cut the hose into lengths for rings, and join the ends with short dowel pieces glued and taped in place. The target peg can be a longer dowel stuck into a drilled board.





Bottle Caps Form Radio Knobs

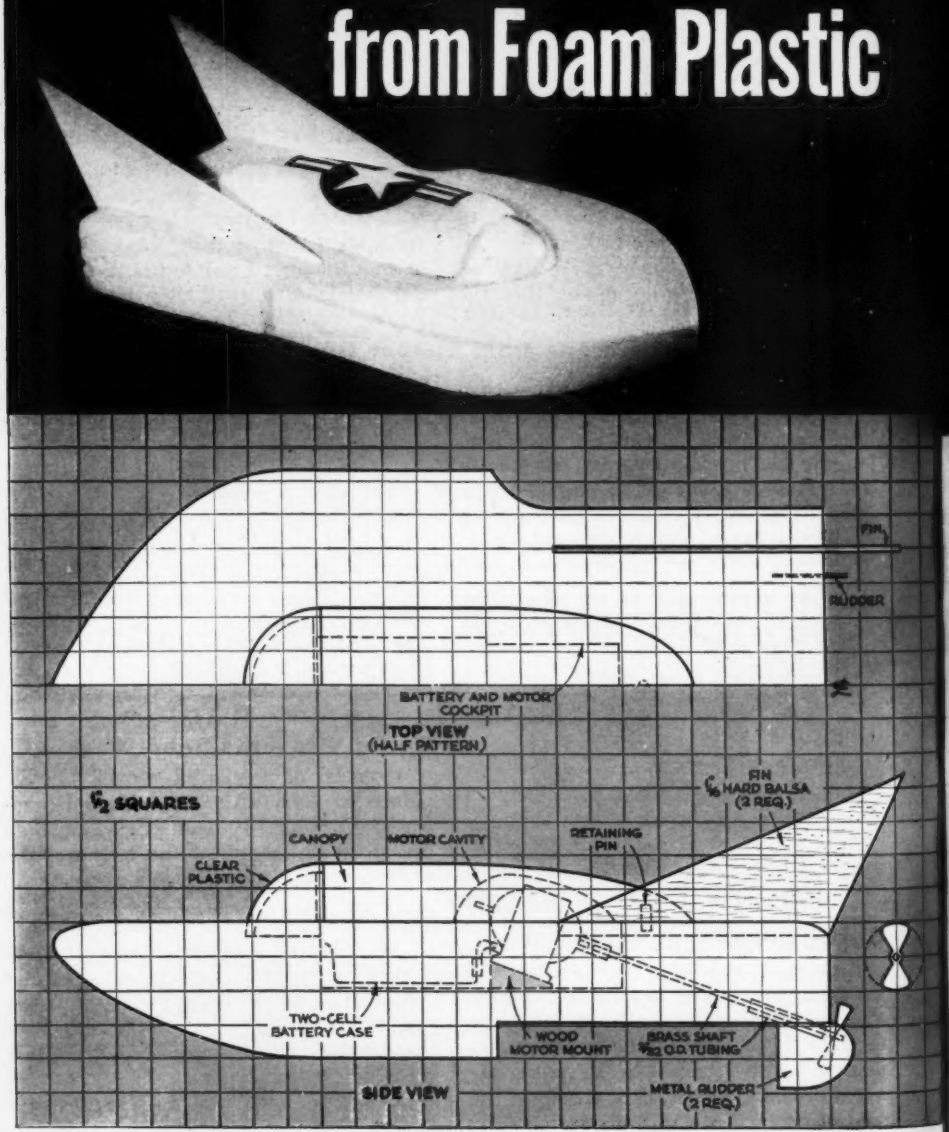
RADIO control knobs can be made from the ornamental caps on cosmetic bottles. Pack wood filler into the caps and force them on the control shafts, which should first be lightly greased to prevent sticking. For round shafts, drill a hole in the side of each cap to take a setscrew.

Burlap Prevents Seed Washout

A PIECE of burlap set over newly planted seeds will keep them from being washed around by watering. Cut the burlap to the shape of the box or pot, as below. Use it until plants appear.

Here's a new and exciting trick for hobbyists—

Shaping Power Models from Foam Plastic



By Louis Boury

BUILD just one model from foam plastic, and you'll wonder why somebody didn't think of this long ago. The stuff is a natural for boats and planes. A 1′-by-3′ piece weighs only half a pound. More buoyant than cork, it never gets waterlogged. The worst that impact can do is dent it, and dents can be filled.

Best of all, it makes for fast work. Rigid foam plastic requires no fussily fitted bulkheads or stringers. Just carve and sand it to shape.

You can buy foam plastic from dealers in window-display materials. It's also sold by novelty and dime stores.

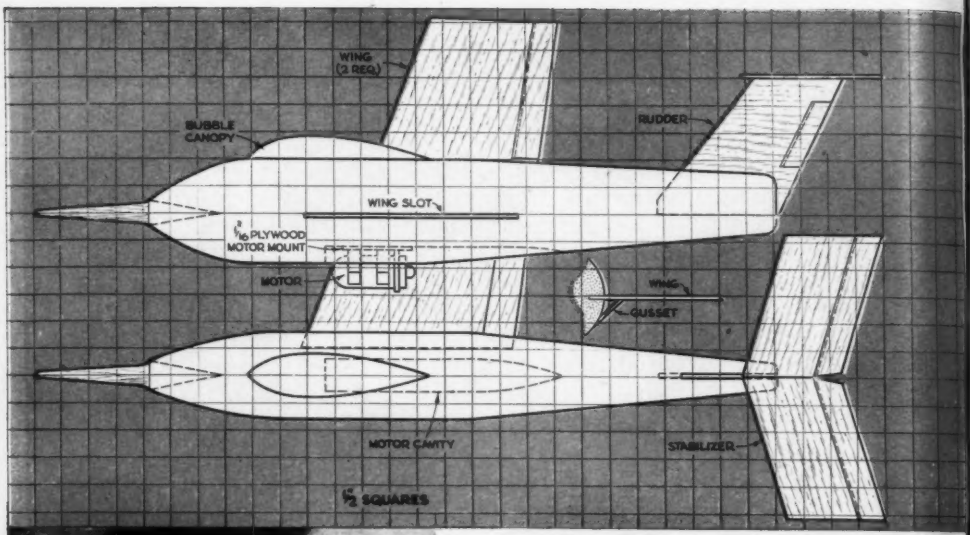
Whittle with sandpaper. A sharp knife will do for rough cutting. Use coarse sandpaper to shape, medium and fine sandpaper to smooth the material. To join parts, use one of the white resin-emulsion glues (never model-airplane or cellulose cements, which dissolve the plastic).

Electric speedboat. Draw a grid of 1″ squares on cardboard, mark where the pattern lines cross, and cut out side and top profiles. Glue together two 1″-thick sheets of foam plastic and draw the centerline on one face. Mark out the top from the half pattern by flipping it over on both sides of this line. Cut to the side profile first, and then to the top outline. Make grooves for the balsa fins with a broken hacksaw blade.

Mount the motor on a wooden wedge. Glue this into the cockpit hollowed out of the hull. Push the brass shaft bearing in at an angle as in the drawing, connecting motor and prop shafts with a bit of neoprene tubing. Cut the propeller from thin aluminum or tin-can stock, punch the hole a tight fit on similar tubing, and press this on the shaft.

Shape the canopy with a step to catch under the plastic windshield. Glue in a bit of dowel at the back to drop into a hole in the hull and hold the canopy in.

A real jet plane. Draw side and top fuselage profiles on a 2″-square bar of



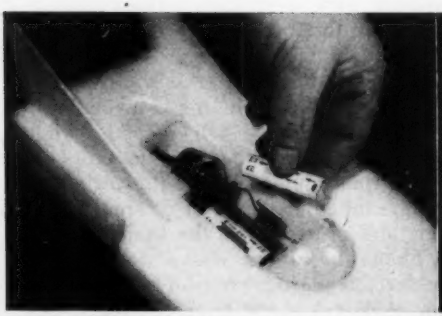
GLUE WING HALVES into slots in fuselage. Brace each with a long gusset glued beneath wing root at a 45° angle (arrows). The motor clips in as shown in this underside view.

foam plastic, marking the wing and rudder slots. Saw these in the bar before cutting the fuselage to shape.

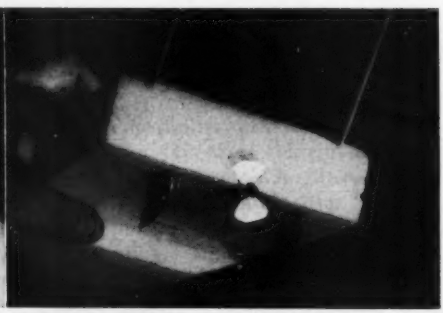
Cut wing and stabilizer parts from medium-hard balsa. Score on the dotted lines for easy bending to make flight adjustments. Coat with clear dope.

Carve the needle nose from hard balsa and glue on a purchased canopy. Attach the jet-motor clip to 1/16″ plywood with screws. Glue the plywood in as shown.

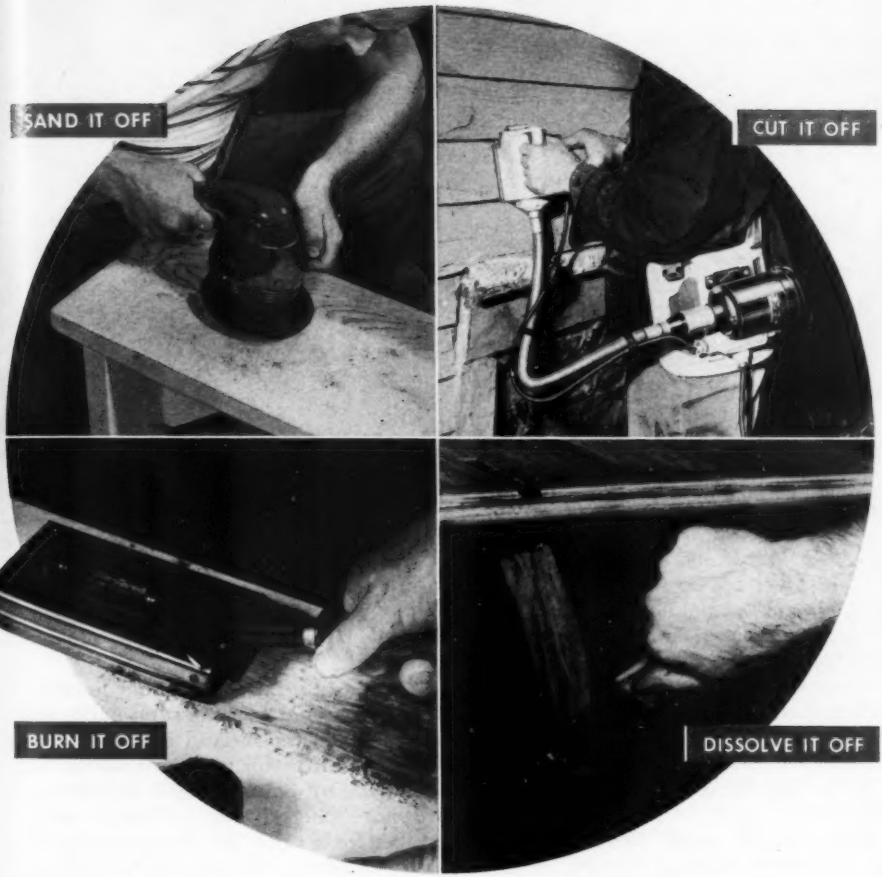
Check with a square to get the stabilizer surfaces at exactly 90° to the rudder, and sight along the fuselage to align them parallel with the wing.



TO MAKE WINDSHIELD, place heat-softened plastic over a glass and push a lamp bulb into it. Cut resulting dome in half. No switch is used. Inserting second cell starts the motor.



CUT HULL SQUARE at sides, but round it off forward below the step. Press metal rudders in with a bit of glue. Double-coat bottom with vinyl-resin glue; finish with spar varnish. END



The Four Ways to Remove Paint

By Darrell Huff

TAKING off old paint, varnish or lacquer is a sure-fire route to greater respect for the people who make the stuff. They're making finishes tougher and more lasting every day.

Fortunately, the folks who think up better ways to remove finishes are on the job, too. New gadgets and developments are taking the fight out of old paint.

What's new? Rotary cutters that actually *plane* off old paint; electric paint peelers that take the heat off the heat-removing method (pyromaniacs can keep on using blowtorches); open-coat abrasives that don't simply transfer a coat of paint from wall to paper—the particles drop off; new paste removers that cling to paint that's not on the level; liquids that come packaged in pressure-spray containers—you just press the button!

The experts say that the secret of

SPRAY-ON REMOVERS are easy to apply. As with liquid and paste removers, the softened paint must then be scraped off the wood.

WATER WASHES AWAY PAINT when you use a new type of chemical remover. The water raises the wood grain, but light sanding smooths it.

easy removal lies in selecting the right method, and in using it in the right way. In general you have four methods of paint removal to choose from:

Heat: burn it off.

Rotary cutting: plane it off.

Abrasives: sand it off.

Chemical removers: dissolve it off.

We'll take these methods up one at a time.

Burning off paint. Let's start with the blowtorch method, getting in and out fast on that one. You move the torch slowly along the siding (blowtorches are for exterior use only) and follow it with a putty knife held in the other hand. The blowtorch treatment works. It has been used for a long time. But many a man has started out to remove house paint with a blowtorch and wound up removing the house.

To cook off paint without the hazards of a blowtorch, use an electric paint peeler. It's a plug-in device containing a heating element and one or two scrapers. It usually costs between $10 and $15.

A peeler should be moved slowly over the surface. The heating element softens the paint, and a built-in scraper peels it off. Some models have a front scraper in addition, for places that the back scraper won't reach. Or you can use a putty knife. At least one variety includes odd-shaped auxiliary scrapers for molded shapes.

You can use peelers for outside or inside work. They work best on paint, not so well on varnish. And their action is a bit too drastic for jobs on furniture.

Cutting off paint. At close to $250 you are not likely to buy a rotary paint scraper for a single job, but you may be able to rent one and save yourself a good deal of time and mess.

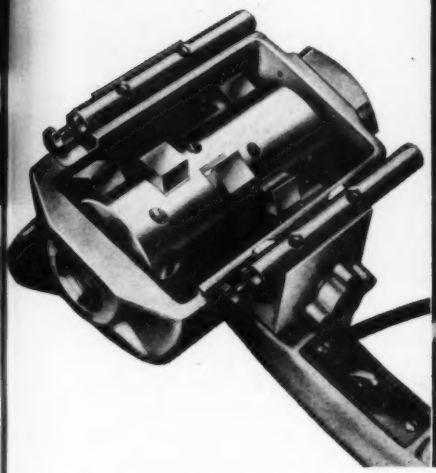
The Roto-Paint Scraper,* is a flexible-shaft tool. The motor hangs on your hip and you hold a special kind of electric plane in your hand. It cuts just deep enough to take off paint. Since the rotary scraper is intended mainly for clapboard, it is shaped to take paint off the underside as well as the face; but it works on flat surfaces—railings, table tops, floors—as well.

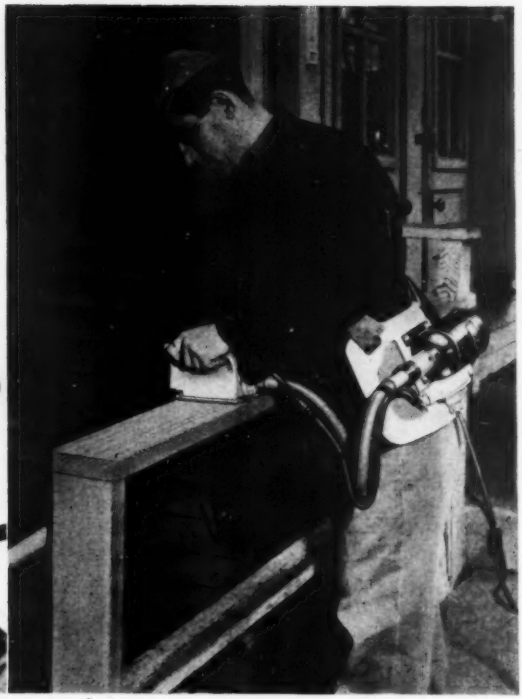
The manufacturer figures that you can cover 100 square feet an hour, making the scraper three or four times faster than the torch or chemical methods.

Sanding off paint. With modern

**The Roto-Paint Scraper is made by the Stow Mfg. Co., 282 Shear St., Binghamton, N. Y. Makers of wash-away removers include Creative Chemical Co. (R.P.O.), 2727 E. Nine Mile Rd., Hazel Park, Mich., and Winfield Brooks Co. (TM-4), Henshaw St., Woburn, Mass.*

FASTEST MECHANICAL WAY of removing paint is this rotary cutter. It planes off the coatings of paint, leaving the wood clean and smooth. The tool is expensive but can sometimes be rented.





abrasives you can cut down almost anything, but sanding is still a slow way to remove heavy coats of paint or varnish. The best bet on furniture work is to use a chemical remover first, then sand it.

If you want to take off much finish by abrasion, use an open-coat paper—the kind with space between the grains—so that it will not load up too rapidly. You can get such papers for disk sanders and for those that take abrasive sheets, but not for belt sanders. Aluminum oxide paper works best.

Chemical removers. The biggest news in unpainting with chemicals is the development of wash-away removers.* They are quite different from the water-flush types that have been around for a long time but limited to industrial work and to metal surfaces.

Wash-off removers may be of paste consistency or they may be thin liquids—either flammable or nonflammable.

You apply the new removers with a brush, flowing them on thickly. After five to 30 minutes, the paint will be so softened that it will rinse away—or will form a water emulsion when mopped with a sopping rag.

You may have to do some scraping, but ordinarily not. As with conventional removers, you may have to put on a second coat of remover if the piece you're working on has several layers of ancient and petrified paint.

The wash-off ones are more expensive than more familiar removers—but may go enough farther to even things up. As they are used with water, they may raise the grain on wood. Light sanding will take care of this. Advantages: They are almost ideally quick and clean for taking paint off metal; they produce less goo and mess, and they permit cleaning the brush in water.

Just as conventional removers vary from brand to brand and type to type in the matter of just which finishes they work best on, so do wash-away removers. One rinse-off type, for instance, is not

very useful in taking off rubber-based swimming pool enamel, while another tackles it as well as the best of the usual types.

Most paint removers leave stained wood untouched while lifting the varnish neatly off it. This is true also of at least one rinse-off formulation *(R.P.O.)*, while another leading brand *(TM-4)* removes stain as well as varnish (and paint, enamel, lacquer, shellac, resin emulsion, water paint, rubber-base paints, and synthetic finishes).

Spray removers. Pressure-pack removers are highly efficient, clean and handy—but rather expensive. These spray cans are easily suitable for fine furniture work and other small jobs.

The spray remover produces a slushy, snowlike deposit that discourages rundown and avoids a thinly liquid mess that would be hard to take off. As a result, this form of remover often does as thorough a job in one application as a liquid type can do in two, neatly balancing the fact that it is likely to cost about twice as much per ounce.

Liquid removers. There are three basic types. Each has disadvantages.

The low-priced removers are inefficient and fairly dangerous to use. They are generally effective only for removal of thin varnish coats on horizontal surfaces. Even then, this may require several applications and fairly messy scraping. A thorough washing of the surface afterwards is essential, since this type contains wax that would interfere with refinishing. The only economy in a cheap (benzol) remover is in purchase price.

Flammable removers of the non-ben-

YOU BRUSH ON both liquid and paste removers. Put the remover on thick and don't brush out or go back over the job. Give the remover

Boiling Shutters in a Chemical Solution Removes the Paint

OLD paint came off two dozen pairs of window shutters with surprising ease when I boiled them in a solution of a common household cleaner (Oakite).

To do the job, I first had a sheet-metal shop make up a galvanized-iron pan 4″ deep, 20″ wide and 72″ long—a little larger than the standard shutter. Then I dug a shallow trench in the back yard and piled the dirt up at the sides, topped the dirt with bricks to support the pan, and set a piece of drainpipe at one end to act as a chimney.

After filling the pan two-thirds full of water, I dumped in three large packages of the cleaner and built a large wood fire under the pan.

When each shutter had been boiled about 10 minutes, the paint was so loose that it could be washed off by turning on the garden hose full force.—*Stanley W. Gilbert, Middletown, Conn.*

plenty of time and it will do most of the work. Rush it—and you will do the work. Blisters (as in the shot above) are a sign that the paint is ready for easy removal by scraping. When the right remover is used correctly, even old house paint should come off easily as at right.

zol type are not explosive and offer no great hazard of fire. They are much less toxic than other types and are harmless to hands and clothing. On most finishes their penetrating action is so great that they will lift an almost unlimited number of coats.

Non-flammable paint removers, the third type, are usually hard on the hands, dangerous to breathe, and somewhat less effective in penetrating than flammable varieties. They are the obvious choice where a fire hazard exists. They also are the most effective kind in removing baked enamel and some synthetic finishes. Some varieties require an after-wash with solvent, some do not.

Paste removers. A good thing about paste removers is that they cling rather than run. This is important on vertical surfaces, of course, but a virtue on others as well.

Thick-bodied removers can do big stripping jobs such as the outside of a house. You can get a pretty good idea of how to do such a job and how long it will take from a recent test that was expertly handled and carefully timed.

Two men started at the top of one side of a big two-story house at eight in the morning, brushing on the remover. They reached bottom in 45 minutes, then did the whole job over again right away, from top to bottom. Then they started to scrape. At 4:30 the putty-knife work was finished and the whole area had been wiped down with rags soaked in paint thinner. It worked out to 270 square feet per man per day.

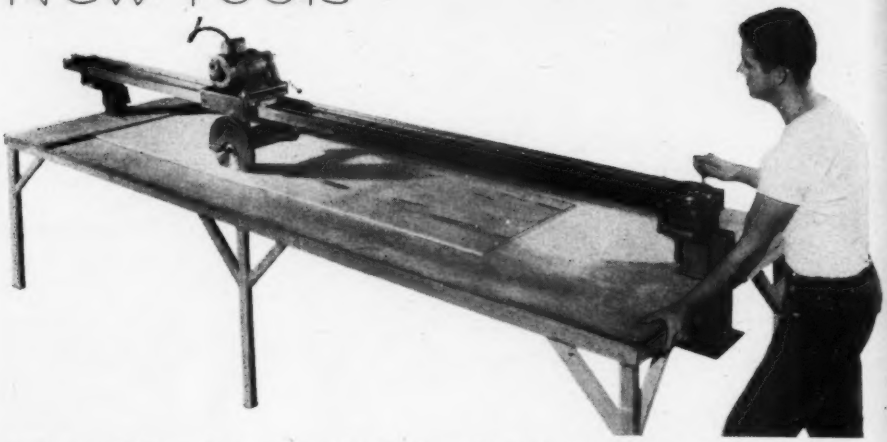
How to apply removers. In using a pressure-pack remover, hold it eight to 15 inches from the surface. Try not to be either stingy or over-generous in spraying work for an ample coat but don't load the surface. Let it stand for several minutes, then test with a putty knife. If the finish doesn't come off down to bare wood, let it stand longer. Finally strip it off with a putty knife. Then wipe with steel wool or a rough rag.

Apply a liquid or paste remover with a paintbrush. Use a brush in good working order, not a worn-out stub. Flow it on thickly, using the flat of the brush. Don't brush it out like paint; this breaks the protective film that forms on the top of the remover to retard evaporation.

If you have trouble spreading a remover of a liquid type you may want to

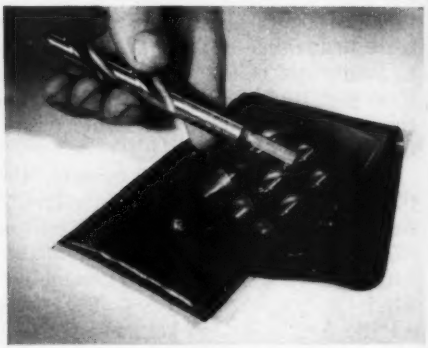
[Continued on page 272]

New Tools

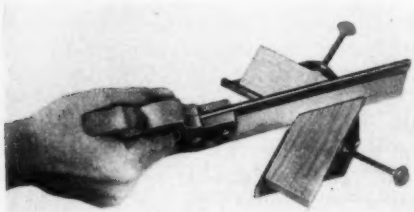


1. Saw on Rails Cuts Long Panels. With this 10″ circular saw on rails, you can cut large sheets of plywood, plastic, metal or other materials in one pass. A wheel at one end controls a cable that moves the saw up and back on steel rails. The unit can be tilted to make 45° cuts. The rails come in lengths of 4′ to 9′.

2. Clamp Holds Odd Shapes. This flexible webbing can be used to clamp glued-up square, circular or odd-shaped pieces. Turning a spring-release ratchet tightens the strap at any desired point.



3. Knurled Bits Lock in Chuck. Special ¼″ knurled shanks make it easy for you to clamp even a cheap chuck firmly on these drill bits. They are available in sets of various size combinations.



4. Corner Clamp Corrects Miters. If a mitered joint doesn't fit, you can lock the pieces together in this clamp and run a saw through to true the cuts. Two thumb screws hold work up to 2″ wide.

Further information on the tools shown on this page can be obtained from: 1. Servi Corp., Constantine, Mich.; 2. Eagle Products, Box 84A, Meriden, Conn.; 3. Hanson Mfg. Co., Worcester, Mass.; 4. Gunver Mfg. Co., 234 Hartford Rd., Manchester, Conn.

How to Adjust Your Brakes

As the linings wear, they must be pulled closer to the shoes. This is an easy hour-or-so job.

By E. F. Lindsley

DOES your brake pedal go down almost to the mat before your car comes to a stop? Do you have to pump the pedal to build up a comfortable pedal clearance? If your car is fairly new or the linings are new, the chances are that a minor adjustment job will clear up the trouble. This is an easy job that you can do in an hour or so some Saturday morning.

The master cylinder for a hydraulic-brake system is a simple plunger pump. For a given amount of pedal travel you pump a specific amount of fluid to each of the four wheels. If the wheel cylinders must push the brake shoes a good distance to contact the drum, the pedal must travel farther to force sufficient fluid down there. The idea is to adjust the shoes so that they barely clear the drums and need only a slight nudge to jack them out into contact.

This is the big difference between a minor and major brake adjustment. A major adjustment sets up basic relationships of the brake anchor pins to give certain design clearances between the brake-shoe heel and toe, and between front and rear shoes and the brake drum. Once this is established by an expert, at the factory or in a good brake shop, even an amateur can make routine minor ad-

justments during the life of the linings.

The star-wheel adjustment system is one of the three main types of adjusting mechanisms. This type is easily spotted by the small elongated dust cover of rubber or metal that covers the wheel. Pry off this cover and you find a notched wheel an inch or so in diameter (you may need a light to see it). This wheel may be at top or bottom of the backplate. Some brakes have two wheels.

Ordinarily a screwdriver thrust into the notches and levered against the side of the slot will turn the wheel. Bending a slight dogleg in the screwdriver will sometimes make it easier. You might also try a beverage-can opener with the end ground square.

A pair of eccentrics or cams are provided for adjustment in some other cars. The business ends project from the backing plate. They are easily attacked after

PULLING THE WHEEL isn't necessary when you do a minor brake-adjustment job, but it offers a good chance to check bearings, linings and possible hydraulic-fluid or grease leakage. Be sure to tighten the bearing nut properly.

AN OLD PAINTBRUSH does a fine job of cleaning dust from brakes. Use it to sweep out the drum as well as areas around the shoes, wheel cylinder and the other working parts. But don't use solvent. It might damage the lining.

LOOSEN ECCENTRIC LOCK NUT about one turn as first step in eccentric adjustment. Flat stem is for adjustment and for holding screw when lock nut is retightened. If cam stud refuses to budge and a snug square socket isn't handy, try the rig shown at right. Invert a ⅜" drive socket and use another socket on a short hex bolt with a jam nut as the coupler.

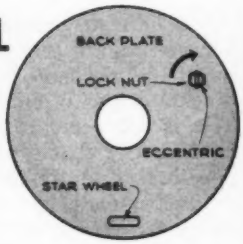
Three common methods of adjusting car brakes

ECCENTRIC CAMS

1 MOVE CAM OUT UNTIL WHEEL LOCKS; BACK OFF SLIGHTLY TO FREE EACH SHOE IN TURN

2 OPERATE BRAKES AND CHECK FOR DRAG

STAR WHEEL AND ECCENTRIC



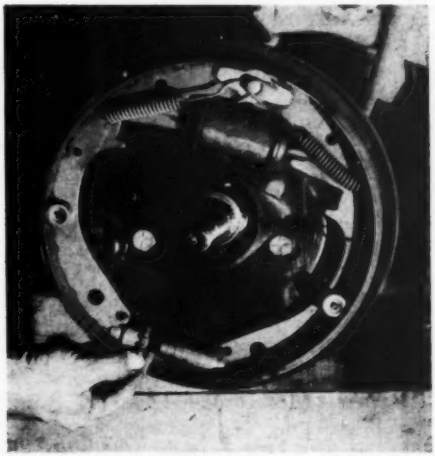
1 LOOSEN LOCK NUT

2 SET SHOE TO .010" CLEARANCE

3 TIGHTEN LOCK NUT AND RECHECK CLEARANCE

4 LOCK WHEEL WITH STAR-WHEEL ADJUSTMENT AND BACK OFF TO FREE

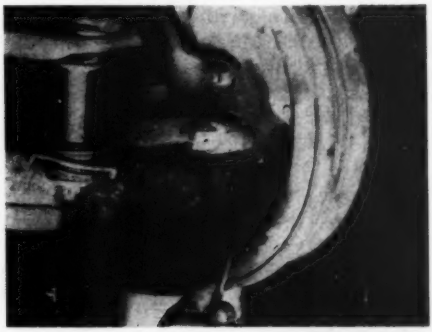
5 OPERATE BRAKES AND CHECK FOR DRAG



STAR WHEEL

1 PRY NOTCHED WHEEL TO TURN IT AND LOCK BRAKE; BACK OFF TO FREE WHEEL

2 OPERATE BRAKES AND CHECK FOR DRAG



HYDRAULIC-LINE INSPECTION might save your life. You'll never have a better chance than during a brake job. Go over the hose and fittings for signs of leakage, drying out, or rubbed spots. Check the metal lines for kinks.

ADDING A LITTLE FLUID to master cylinder, to compensate for greater amount now remaining in wheel cylinders, is the final step in a brake job. Before removing the cover, be sure to wipe away all dirt from the surrounding area.

you scrape away the mud and road tar.

Since each shoe has a cam, you must adjust first the front and then the rear shoe on each wheel. There is nothing difficult here except that corrosion sometimes sets these parts to an eyeball-popping tightness that demands a good wrench and real manpower to move.

A combination of star wheel for final adjustment with an eccentric for initial adjustment is the third system, also very common. The eccentric is an innocent-looking little flat-sided screw with a lock nut. It turns much easier than the previously mentioned cams, once the lock nut has been backed off about one turn. You'll probably find that a very minute adjustment will lock the wheel solid. So be careful when retightening the lock nut that the adjusting screw doesn't sneak up a turn on you.

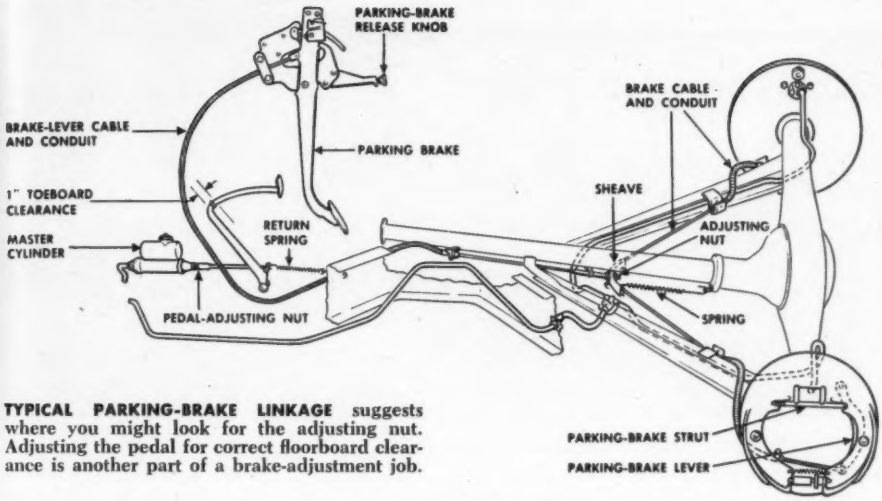
This type of brake often has a slot in the drum through which you can poke a feeler gauge, usually specified as .010″ thick, to set the eccentric. This is the best method, but you probably will make out all right if you merely tighten the eccentric enough to lock the wheel and then back it off until the wheel is free. Follow this up similarly with the star wheel: Tighten to locked-wheel position, then back off slightly.

It's best to remove the wheels. If you go into a garage for a brake adjustment, the mechanic probably will do it quickly without removing the wheels. This is not necessarily wrong. It's certainly better than driving around with poor brakes. On the other hand a lot of dust accumulates in brake drums. To an inexperienced adjuster the noise of dust may sound as if the shoes are dragging. The result is that he backs off the adjustment *too* far.

Hence the writer recommends pulling at least the front wheels—if for no other reason than to check the condition of the lining and to study the construction of the brake so that you'll understand how the adjustment works.

Be careful to keep dust from falling into the wheel bearings. Repack the bearings with clean *wheel-bearing grease*. You may not care to pull the rear drums once you have the feel of adjusting on the fronts. As a matter of good practice, however, if the drums can be removed without resorting to heavy-duty pullers, cleaning is worthwhile.

When you replace a wheel, use care in tightening the bearing nut or you may wind up with shimmy and fast tire wear. The recommended method is to pull up on the nut until drag can be felt



TYPICAL PARKING-BRAKE LINKAGE suggests where you might look for the adjusting nut. Adjusting the pedal for correct floorboard clearance is another part of a brake-adjustment job.

when the wheel is turned. Then back off to the closest cotter pin. If the nut doesn't seem to have a slot in quite the right spot, cut a thin shim washer and put it between the nut and bearing outer washer.

The entire operation can be summarized as follows: Jack up the car and adjust either the star wheel, the eccentric and star wheel, or the front and rear cam on each wheel to lock the wheel. Then back off slightly for free running. Work the brakes and recheck for free running several times. When adjusting the rear brakes, be sure that the hand-brake cables aren't too tight and holding the brake in the on position, or that they are so loose as to be useless.

Check for an inch or so of free travel of the brake pedal on conventional brakes. (Power brakes use less free travel.) If you don't have at least an inch of free pedal travel on a conventional system, ease off on the connection between the pedal and master cylinder until you do. Failure to have this clearance may result in dragging brakes if the fluid in the system expands from heat and forces the master piston backward in the cylinder, and the pedal goes down before the lip of the piston cup clears the cylinder relief port.

Adjusting the hand brake. Before adjusting the rear brakes, it is a good idea to give a lusty tug on the cables leading to the hand-brake linkage. These are easily identified since in most cars they run from the rear-brake backing plates to some sort of pull-rod linkage under the drive shaft or transmission.

Tight cables could interfere with adjustment, so the instruction manuals all say to slack them off by loosening the adjustment nuts where the cables join the pull mechanism. Actually, the opposite is generally the case, with the cables sloppy enough to permit adjustment and stand a bit of tautening.

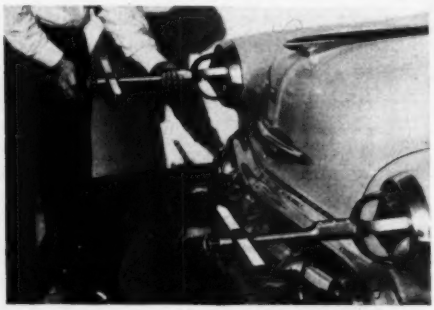
For a practical sequence, check the cables and loosen if needed; adjust the brake shoes and try the foot brakes; then snug up the cables so that they are just tight enough to get results when needed, but not so snug as to prevent complete release of the emergency system.

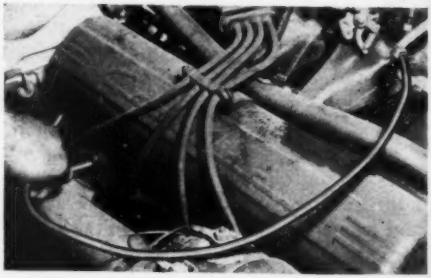
There are two ways to check for overtightening of the cables: One is to let some friendly driver flag you down and inform you that your rear brakes are smoking. A better way is to spin the drums by hand while someone works the hand brake to see if there is an inch or so of free movement before the drag of the wheels is felt. END

New for Your Car

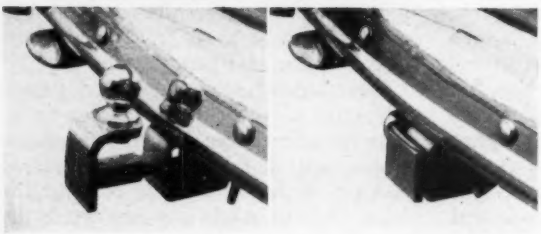
1. Plastic Cover Converts Pickup Truck. A one-piece plastic top, light enough for two men to install, will make a panel truck of a ½- or ¾-ton open-bed pickup. The model shown above has windows and a rear lift door; another like it is windowless; and a third type, for sportsmen, has a shelf to carry a mattress.

2. Gauges Aim Headlights Fast. A pair of headlight adjusters fitted over any sealed beams, as below, permits checking in two minutes and accurate aiming in 10. Four calibrated levels show when your headlights are aligned. Suction cups hold the instrument on the lamps.



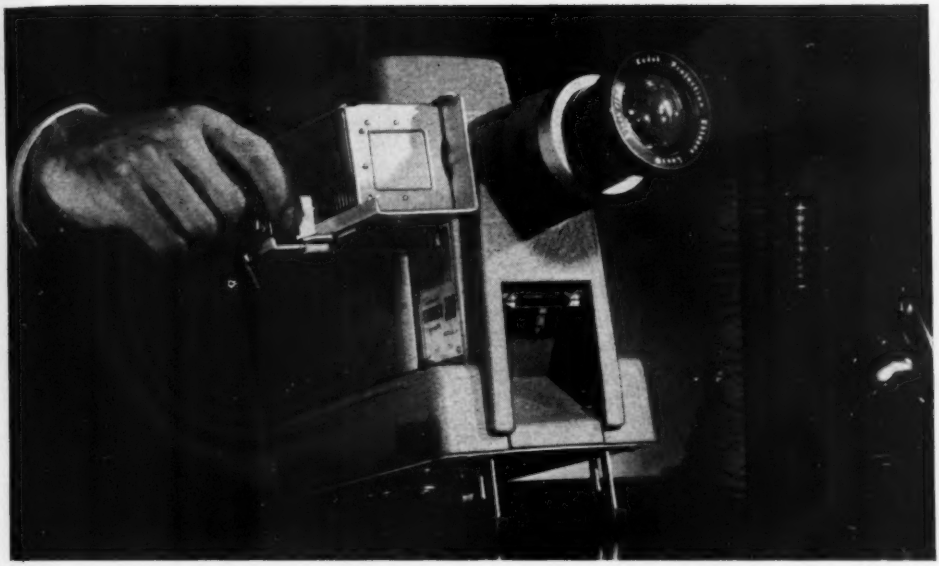


3. Needle Probes Insulated Plugs. When the old screwdriver-test method is difficult, you can contact the top of a spark plug by injection. This tester, grounded to the engine, has a 1″ needle that is pushed through the housing. The needle hits the top of the spark plug and forces a cylinder miss if the plug is firing.



4. Trailer Hitch Slides Under Bumper. By turning the shank of this trailer hitch 90°, you can push it under the bumper when it is not being used. Tightening a setscrew locks it in place. A special model is made for station wagons.

Further information on these new car products can be obtained from: 1. Barrett Div., Allied Chemical & Dye Corp., 40 Rector St., NYC; 2. Trulite Corp., Box 126, Van Nuys, Calif.; 3. H. C. Sweet Co., 12345 Telegraph Rd., Detroit 39; 4. Specialty Engineering, Inc., 391 Topping St., St. Paul 3.



What makes a Kodaslide Signet an outstanding slide projector?

Quick, positive focusing for needle-sharp images

All major controls grouped conveniently together

Changer to feed, restore slides, with push-pull ease

Air-cooled for your slides—never even hot to the touch!

That's easy. Top-quality performance. For the thrill of brilliant, big-screen slide projection, you can't beat a Kodaslide Signet Projector. A fine Ektanon Lumenized Lens, together with close-coupled condensers, is your assurance of sharp, bright images of highest color purity.

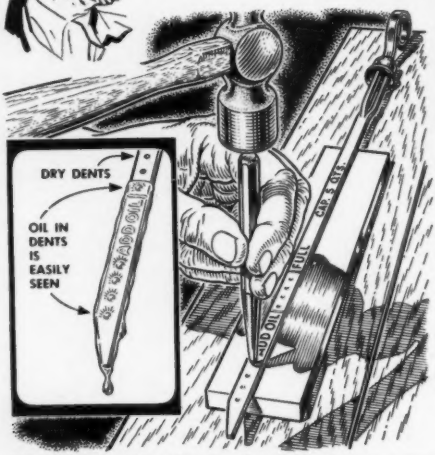
And thanks to a 6-way selection of models, your Kodak dealer can show you a Signet with the features you want . . . at the price you want to pay. Prices range from $59.50 for a Signet 300 with *f*/3.5 lens and single-slide changer, to $89.50 for the Signet 500 Projector with *f*/2.8 lens and automatic changer. (Signet 300 with automatic changer, shown above, $69.50.)

Prices are list, include Federal Tax, and are subject to change without notice.

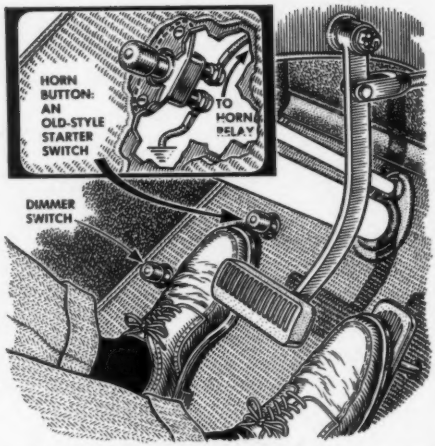
Eastman Kodak Company
Rochester 4, N. Y.

Kodak

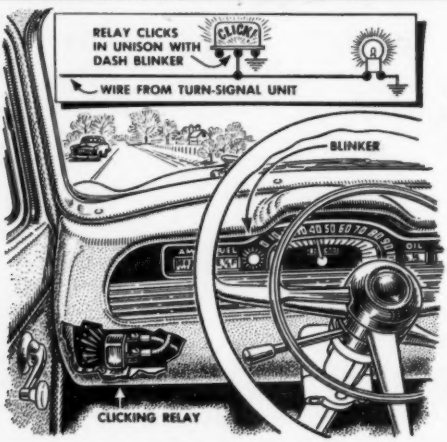
Hints from the Model Garage



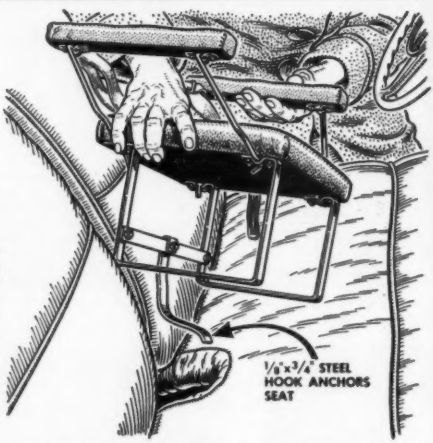
It's easier to check the oil in a warm engine containing light oil if you make a series of dents along the dipstick with a center punch. Oil held in the dents will be easily visible even when it's difficult to see any oil on the stick.



That idle left foot always bothers a veteran driver when he first drives a car that lacks a clutch pedal. Here's one man's solution—an auxiliary horn button on the floor. The switch is a single-pole, single-throw, normally-off job.

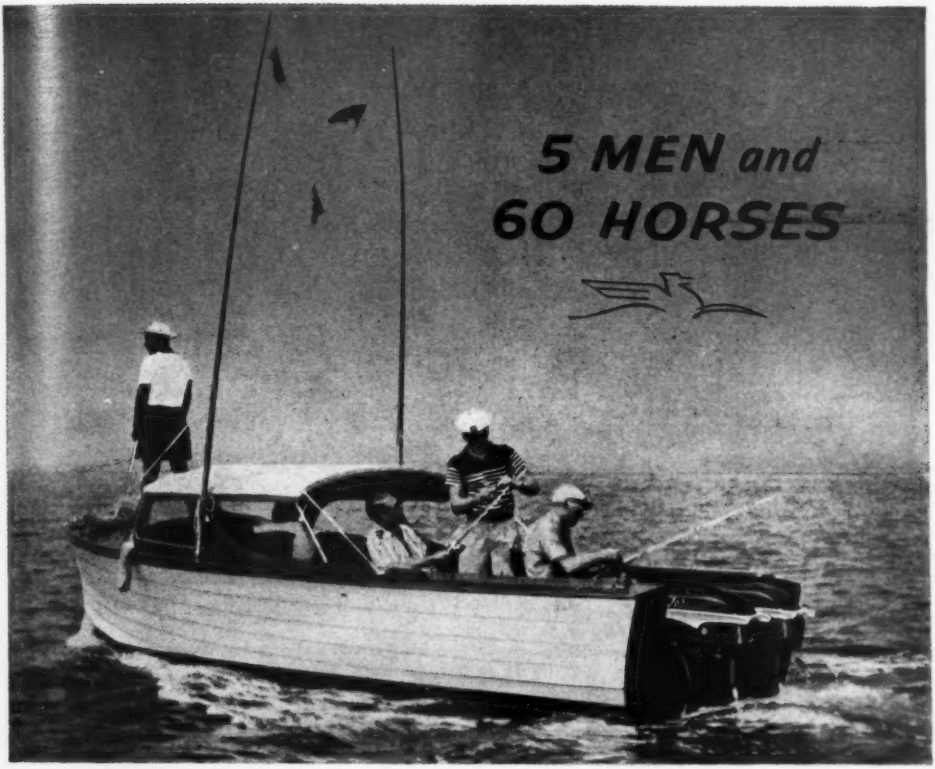


Safeguard against turn signals that continue to blink when they shouldn't by installing this added warning system. Wire a 6-volt DC relay in the circuit with the warning blinker. If you don't see the blinker, you'll hear the relay.



Anchoring a child's seat is a simple matter in cars with a center hole between the front seats. Bolt on a steel hook like this. Swing the hook in an arc through the hole to engage the seat securely, giving the child a safer ride.

 Please turn to page 236 for more auto hints



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SEA-HORSE 30	30 hp.	462.00
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SEA-HORSE 7½	7½ hp.	241.00
SEA-HORSE 5½	5½ hp.	216.00
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*Electric Starting....Prices f.o.b. factory, subject to change....All models except the "8" have separate Mile-Master Fuel System...OBC certified brake hp at 4000 rpm (30's at 4500).

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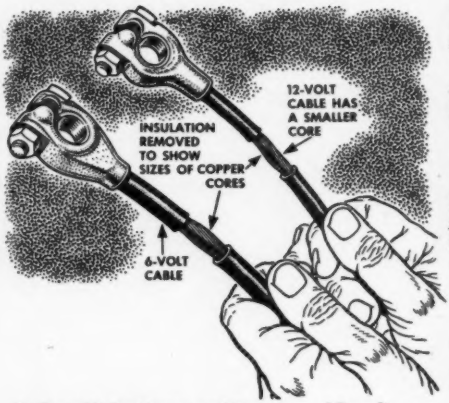
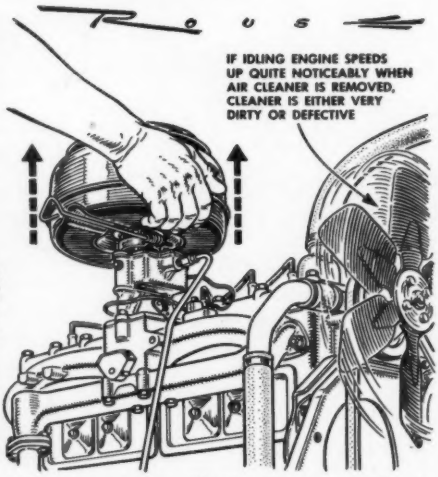
More Hints from the Model Garage



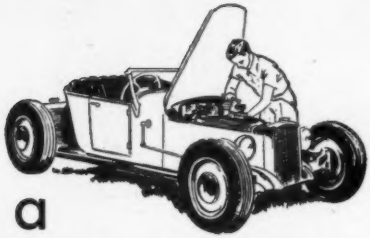
A 6-volt battery cable on a 12-volt car works fine, but don't try it the other way around or you'll get sluggish action. The reason? To save copper, manufacturers make 12-volt cores smaller since they must carry only half the amperage to produce the same wattage (volts × amps).

A removable caster like this will keep a small trailer level when it's unhitched—and make it easier to shove around. Bolt the flange to the underside of the tongue. Carry the rest of the caster unit in the trailer or tow car. Before unhitching screw the pipe into the flange.

A battery hydrometer may get dirty and milky inside after long use. To clean, dissolve a tablespoon of detergent in a pint of warm water. Suck the solution into the hydrometer and let it stand for a half hour. Then rinse with clean water.



An air cleaner that's dirty outside is undoubtedly dirty inside. So you ought to clean it. Idle the engine as you take it off. If the engine begins to run faster, you can be sure that the cleaner is very dirty—or not functioning properly.



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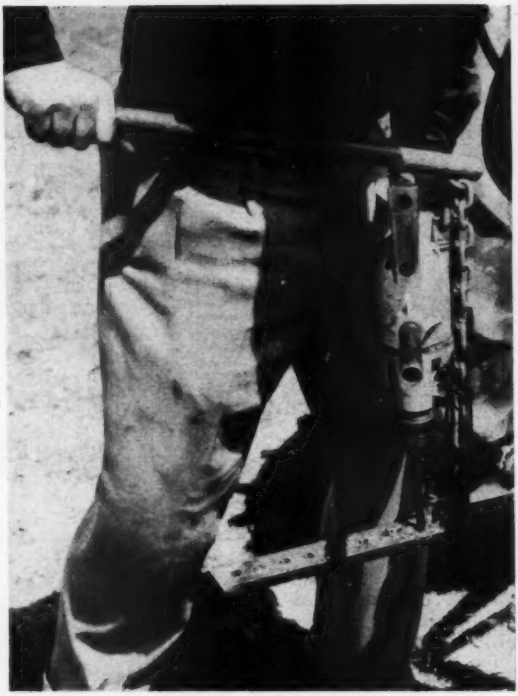
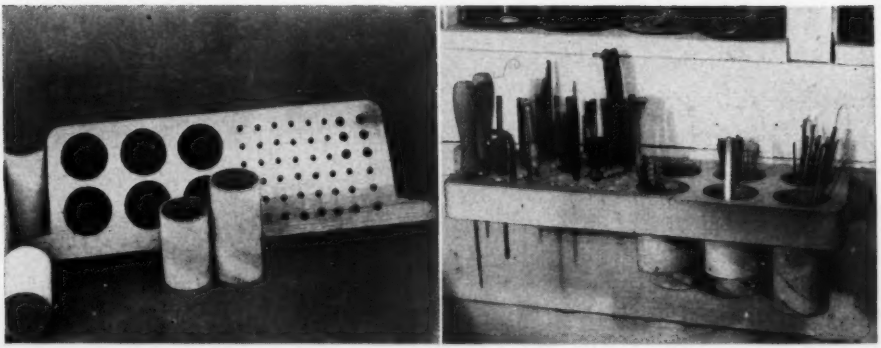
Drilling of Long Work Speeded by Chain Rig



When drilling work supported only at one end, a rig like the one at right gives you leverage and holds the other end of the work steady against the bit. Weld the end of a chain to a pipe, and also weld to the pipe a small knob to fit into a hole in the drill handle. Hook the chain around the work near the spot to be drilled. As you push, the work is pulled into the bit.

Simple Rasp Faces Edges

Metal lath nailed to a piece of two-by-four makes a handy rasp for dressing rough edges of sheetrock or similar materials. Bend the metal around the long edge of the wood block and nail the two sides. Unlike a regular rasp, this tool won't gum up.—*W. Howe, Longview, Wash.*



Mail Tubes Form Rack for Storing Saw Blades and Small Tools

Pockets made from cardboard mailing tubes keep small jigsaw and saber-saw blades neatly sorted in this rack. I cut the rack from 1⅜″ pine about 6″ wide by 15″ long, leaving on a short shoulder at each end to screw to the wall. Six sections of 2″ mailing tube were sawed to various lengths to take different sized blades, and were glued into holes in one section. Circles of ¾″ pine were glued and tacked on for bottoms.

In another section I drilled several rows of holes, some part way through to hold small machine files and some all the way for screwdrivers, punches and awls. I then sanded the top smooth and applied a coat of shellac for a slick finish. —*Dick Hutchinson, San Gabriel, Calif.*

6 1/2" Heavy-Duty Saw home workshop budget!

Races through a 2x4 even at a 45° angle, with blade to spare!

Here's *more* saw for your money! This sensational new B&D 6½" Heavy-Duty Saw offers you: *extra capacity* . . . cuts 2⁵⁄₃₂" at 90°, 1⅛" at 45° . . . *extra power* . . . custom-built B&D motor, runs cool, without stalling . . . *extra safety* . . . automatic telescoping guard with larger retracting lever; instant-release trigger switch with guard; open-end handle; grounding wire in cable . . . *extra adjustment features* . . . larger wing nuts for fast, positive depth and bevel adjustment . . . *extra convenience* . . . clear view operation, with sawdust blown away from operator and work! See your B&D dealer, or write for free details: THE BLACK & DECKER MFG. CO., Dept. S-36, Towson 4, Md.

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LOOK IN YELLOW PAGES UNDER "TOOLS-ELECTRIC"

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PORTABLE ELECTRIC TOOLS

Drugstore pills give

Quick Heat for Shop Jobs

QUICKIE STOVE for heating glue is made by punching three broadhead roofing nails part way through the rim of a tin-can lid. Place two or three tablets on the lid and renew them as they burn away. Glue and other liquids are best heated in a double-boiler arrangement of two cans of water, to prevent burning by hot flame.

BURNING a pill-size fuel can give you enough heat to braze metal, melt glass, or do any of a number of jobs around the shop that require a hot flame. The tiny tablets with the big name—hexamethylenamine—are available at drugstores for about 50 cents a hundred.

The pills light easily with a match and take fire slowly, reaching an intense, almost invisible flame. With the setups shown, you can do many jobs that would normally require much heavier heating equipment.

The baby blowtorch made from an old ball-point refill delivers a hot, pinpoint flame that easily handles delicate, high-temperature silver soldering and brazing. To make one, pry the ball out of the pen's tip and enlarge the opening with a knife if air doesn't blow through it easily. Swab out the barrel with a pipe cleaner and attach a short length of rubber hose to the rear end. You provide the blow by puffing into the tube.

Each tablet burns for about three minutes. One tablet is enough for softening, bending or drawing glass tubing. Use two tablets for glass blowing. With the blowtorch you can soften small areas and join seams in glass.

For quick heating of glue, test tubes, small bits of plastic and other materials, you can make a simple legged stand out of a tin-can lid. The tablets are safe if kept or carried in a closed jar. But once you light one, don't let it roll into some inaccessible place where it might start a fire before you could reach it.—*Kenneth Murray, Colon, Mich.*

YOU CAN BEND GLASS TUBING by holding it over a burning tablet set on the upturned bottom of a tea strainer. Strainer gives good ventilation, but be careful that the tablet doesn't roll off. A metal ash tray will also hold it.

BABY BLOWTORCH blows fire from hexamethylenamine pill into a fine, pinpointed flame just right for delicate soldering. Use an empty ball-point refill stem, and coil a length of wire to hold the tablet just ahead of the tip.

APPROXIMATELY

*22 DIFFERENT BRANDS OF SANDERS TO CHOOSE FROM

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WHICH IS THE BEST SANDER FOR YOU . . . ?

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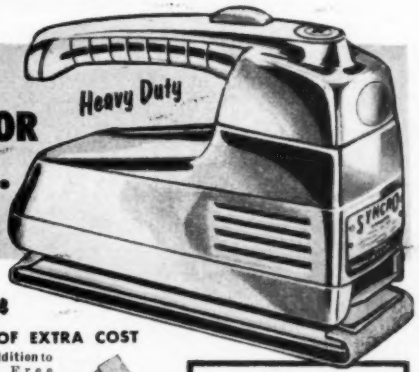
RENT—TRY THIS SANDER ON YOUR OWN JOB . . . RETURN FOR PROMPT RENT FEE REFUND . . . OR BUY IF IT SATISFIES YOU!



SEND NO MONEY

DO THIS: (1) Send coupon, your tool dealer name, address—we'll ship No. 900 Sander, Sanding Handbook, Sandpapers to you. (2) Pay postman $20 (10 days rental fee), COD fee, postage charge, on arrival. (3) Use sander 10 days, return it prepaid—we'll refund your $20 promptly. (4) To buy it, pay dealer (named on coupon) balance of $19.93. Send us *receipt of purchase* from dealer, we'll ship you $3 worth of sandpapers as our Gift! (OFFER ENDS JULY 1, 1956.)

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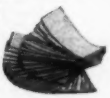

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Send me Syncro #900 Sander COD on 10 Day Rent Fee Refunded Offer. Within 10 days after Rental Period I may either (1) return Sander prepaid to factory only (Syncro Corporation, Oxford, Mich.) for prompt $20 refund. Or (2) I may pay dealer direct (named below) balance of $19.93 and I will own Sander. Offer ends July 1, 1956.

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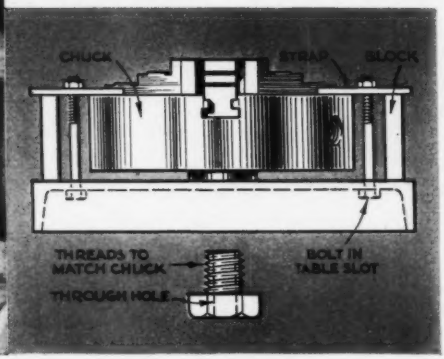
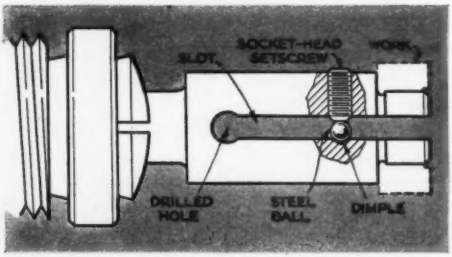
New Shop Ideas



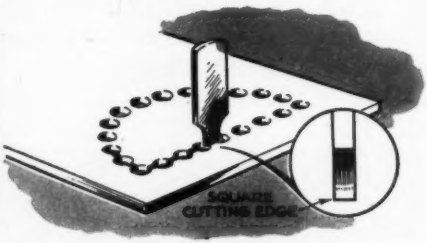
Chuck Centers Drill Work. Holes are automatically centered in round work if a lathe chuck is used as a drill-press vise. One way to mount it is with a hollow bolt threaded like the lathe spindle. Insert it through the table hole and tighten the bolt in the chuck body. Long work can pass through the bolt hole.

Hold-down straps, blocked up outside and held with long bolts, can also be used. To center the lathe chuck under the spindle, lock a ½" rod in it, bring down the spindle, and tighten the drill-press chuck on the projecting part of the rod. Then tighten the lathe chuck down. *—Phil McCafferty, Stanwood, Iowa.*



Arbor Grips from Inside. Useful for machining small rings and bushings, this arbor is turned between centers to fit a standard lathe collet. Drill a cross hole, back from the end, mill or saw a slot to it. Run the setscrew tap drill through to form a dimple for a small bearing ball.

With the ball in place, tighten the setscrew just snugly. Then mount the arbor in the collet to turn the work-holding shoulder down to its final size.—*H. J. Gerber, Stillwater, Okla.*



Broach Cuts Between Holes. Big openings are often made by drilling small holes along the desired outline and cutting between them. This simple broach, made from a piece of power-hacksaw blade, shears the metal cleanly. Grind it, keeping the end *square*, not beveled.

Cut between two holes at a time by hitting the tool with a hammer. In steel thicker than 3/16", work from both sides. Wear goggles to protect your eyes from chips.—*Leonard A. Kroll, Brooklyn, N. Y.*

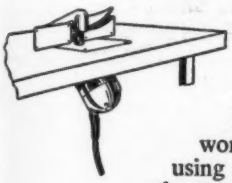
 Please turn to page 246 for more shop tips

Look! Router At Work

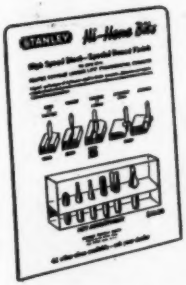
Those of you who have never used a router need only see one at work to be fascinated . . . need only try one to want it for your own shop.

The router shown here, cutting a decorative edge, is Stanley's No. H15. Its ¼ hp Stanley-built motor powers a wide variety of bits at a smooth cutting 27,000 rpm. For heavier duty we recommend the ½ hp Stanley H45 Router.

Look Again! It's A Shaper



Now it's a shaper! The Stanley Router converts to a useful shaper when mounted on your work bench as above, using the special shaper adapter kit. Same router motor powers shaper. With H15 Router use Kit H127 . . . Kit H26 if you have H45.

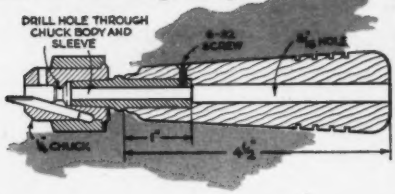


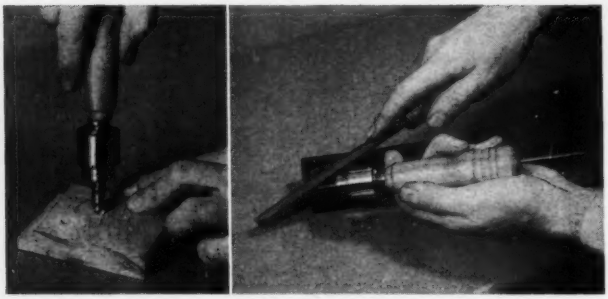
You'll want a variety of bits for your router. This H27 Assortment of "Hi-Hone" bits gives you 6 of the most popular. Your dealer has a full selection of Stanley bits and cutters for router and shaper. Start with the H27 pack and add as you need.

Stanley Routers are on display at your favorite hardware store or building supply dealer's. Ask for a demonstration. For further details send for Catalog 400. Write Stanley Electric Tools, 2503 Myrtle St., New Britain, Connecticut.

STANLEY

More Shop Tips





PUSH THE SLEEVE or spindle into the wood handle. Then drill tapping size for the retaining screw through both parts. Tap the hole in the metal sleeve; in the handle, open it to clearance size.

CHUCK CAN BE USED to countersink, deburr, ream or enlarge holes by hand (far left) or to hold work for hand jobs like filing. Long pieces can pass through the handle. The key-type chuck shown affords maximum grip.

Handy Hand Chuck. A pin vise with a capacity up to ¼" is useful for turning taps, reamers, drills and countersinks by hand, and for holding small round parts to be filed, ground or polished. It's easy to make one from a small drill chuck and spindle salvaged from an old hand drill, or with a new chuck and a mounting sleeve that is turned to fit it.

Open the chuck jaws fully so that a ¼" hole can be drilled through the body as in the drawing above. Drill a similar hole through the spindle or sleeve.

Bore the wooden handle a close fit for this part, and drill a hole through the rest of the handle so that long work can pass through. Secure the chuck with a 6-32 screw.—*Walter E. Burton, Akron.*

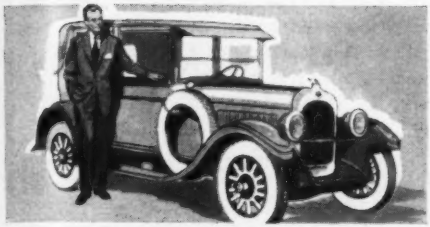
Wrench Speeds Lathe Shift. Changing feed direction on some older lathes requires opening the gear case and using two hands and a wrench to loosen a lock bolt, shift the reverse lever, and retighten the nut. Here's how to make it a one-hand job, and one that you can do without swinging back the gear-case cover.

Replace the original lock bolt with a ⅜" hex-head bolt. Drill and tap the bolt head for a No. 12 screw, and braze a washer under the head. Add a loose washer, and screw in the bolt.

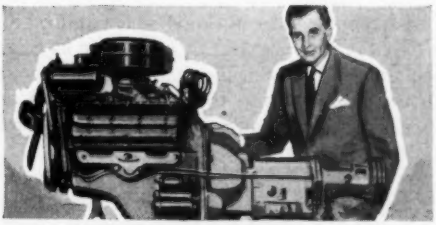
Saw the end off an inexpensive open-end wrench, and clamp it against the tight washer with a spacer cut from tubing big enough to pass over the bolt head. On the lathe shown, it was necessary to anneal the shank and bend it to clear the flange of the gear guard.—*Howard G. McEntee, Ridgewood, N. J.*

Bill Lundigan* shows how the Automobile engine has improved

(*Your TV host on "Shower of Stars" and "Climax!")



1. "BACK IN THE TWENTIES when the Charleston was the dance and cars had rumble seats, a young fellow named Walter P. Chrysler brought out a car with something the experts said wouldn't work—the high compression engine! It *did* work and became the standard engine for years to come.



2. "THE NEXT MAJOR ENGINE IMPROVEMENT *also* came from Chrysler Corporation—the hemispherical combustion chamber! For the first time airplane engine principles were applied to quantity-produced automobile engines, offering far greater power, performance and economy.

3. "IN THIS EXCLUSIVE DOME-SHAPED CHAMBER fuel burns fast and clean and there are no corners to collect power-killing carbon deposits. No other engines operate at peak efficiency for so long a time. It's the first really new automobile engine design to appear in cars in 26 years!

4. "THE CHRYSLER '300'—boasting a 300 horsepower hemispherical combustion chamber engine—won almost four times as many races as the nearest competitor in the 1955 NASCAR and AAA competitions. Real testimony of this engine's outstanding performance and all-'round superiority!

5. "THE ENGINE OF THE FUTURE already has been tested successfully in a stock car—Chrysler Corporation's *gas turbine* engine! It has no carburetor, no piston rings, no radiator . . . only one spark plug and runs on ordinary fuel without throwing flames from its specially designed exhaust.

6. "MORE AUTOMOTIVE 'FIRSTS' have been chalked up by Chrysler Corporation than any other car maker. Many have been copied, many are still exclusive with Plymouth, Dodge, De Soto, Chrysler and Imperial. All are reasons why you get more from a Chrysler Corporation car!"

CHRYSLER CORPORATION — **THE *FORWARD* LOOK**

PLYMOUTH • DODGE • DESOTO • CHRYSLER • IMPERIAL

when you clean out the tank," Stan Hicks began to protest, and then, looking shrewdly at Gus, closed his mouth.

IT TOOK 13 gallons to fill the 17-gallon tank. With the tank full, Gus started the engine easily, revved it up a few moments, got out, leaving it running.

"I'll bet," he said thoughtfully to Silas, "that the first thing you did when you were towed into the garage at Six Corners was to have gas put in—about three gallons, I'd say."

"How did you know?" Barnstable asked in astonishment. "Sure, I had three gallons put in. I had a quarter of a tank. That made enough to get me home, and it wasn't any cheaper at Six Corners than here in town."

"So," Gus said softly, "your gas gauge showed a quarter tank the first time you stalled, just as it did the second time."

"That's right," Silas admitted.

"Well," Gus said, speaking positively now, "you've got a break, a hole in the gas-tank suction pipe, inside the tank. That pipe reaches from the top almost to the bottom of the tank to draw gas. When your gas level got down to a quarter full, it uncovered the break, and the fuel pump naturally sucked air through the line instead of gas. If you'd filled your tank in the city, or at Six Corners, you'd have come home without any trouble."

"Hole in my gas tank!" Silas' thin features were indignant. "How much is that going to cost to fix?"

"That depends," Gus told him, backing to the bench and lighting his pipe, "on where and from whom you bought the car, Silas. Now if you'd bought it from our local dealer, he'd pick it up in the morning and install a new gas tank for you, free of charge. He might even manage to have your towing charges refunded."

"Tow charges refunded," Silas crowed. "Fifty dollars?"

"Plus my towing charges," Gus reminded him.

"But," Silas protested, "I bought this car from . . ."

"That's what I reckoned," Gus interrupted. "Maybe your outfit will take care of you, and maybe they won't. But in any event, Silas, they're 200 miles away."

Silas Barnstable's face was a picture of newly dawning dismay.

"But don't you worry, Silas," Gus went on, and Stan Hicks caught Gus's sly wink. "If they won't fix you up in the city, Stan and I will take care of you. Now let me see—installing a new gas tank, and then there's my towing charges . . ."

SILAS BARNSTABLE didn't wait to hear more. He stepped on the gas and drove out of the Model Garage, his lean chin thrust forward like the nose of a pointer.

"Man, is he burned," Stan Hicks chuckled. "But how, Gus, could you be so sure there was a break in that pipe?"

"I didn't get wise," Gus told him, "until the second time we blew out the gas line and put air pressure into the tank. The air pressure forced gas to flow from the disconnected line as it always does under such conditions. But with one difference. Raw air was introduced into the gas stream through the break above the gasoline level. That gas came through the line like carbonated soda pop. When I coupled this with the fact that Silas had stalled twice, each time with his gas gauge reading a quarter full, with a new car, I knew. Naturally, when Silas had three gallons of gas put in when he first was towed at the Six Corners garage, the mechanic there couldn't find anything wrong, and gave him some sort of a motor tune."

"I see," Stan said. "I wonder how much money Silas will really save, when he finally adds everything up?"

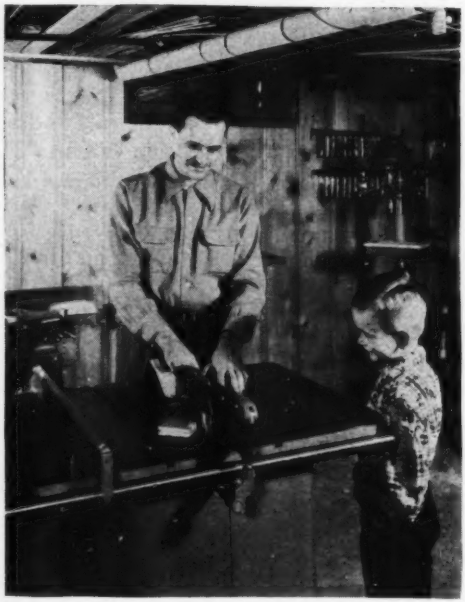
"I think," Gus told him, "that the old codger is about to learn a lesson in economics. Or maybe," he chuckled, "maybe he'll just keep his tank filled hereafter above the quarter level." END

NEXT MONTH: Gus meets a flood of trouble.

ROCKWELL-BUILT

DELTA power tools

NOW as little as 10% down • up to 24 months to pay



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Now you can own the finest power tools in America—real DELTA Quality Power Tools—on terms designed for you!

SO EASY! Easy on your *pocketbook*—as little as 10% down! Easy on your *budget*—up to 24 months to pay! And on terms that suit *you!*

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WHY WAIT? Start, add to, or complete your workshop *now!* The easy Delta Budget Plan is available at all Delta Dealers' (under "TOOLS" in the yellow pages), and leading hardware stores. Send the coupon for free catalog.

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DELTA QUALITY POWER TOOLS

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Delta Power Tool Division
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- ☐ Please send name of my nearest Delta Dealer.
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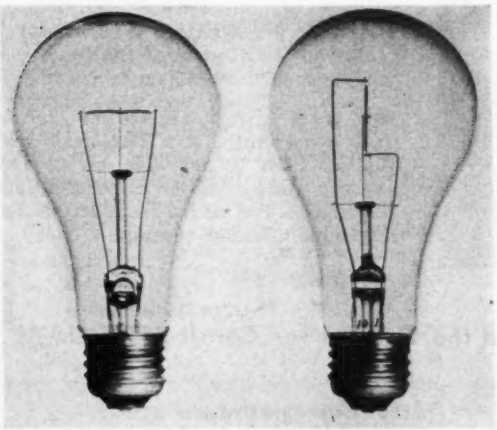
Spray-On Plaster Goes Up Fast

USING this adjustable nozzle, a compressor and a mixing unit, one plasterer now sprays on 1,800 to 4,000 square yards of plaster a day, about four men's hand work. E-Z-On Corp., Chicago, makes it.

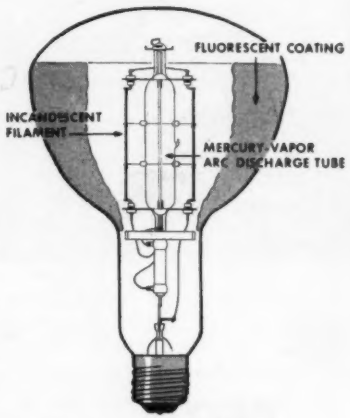
Parking Lot Keeps Cars Warm

OUTDOOR parking in winter is no problem in this parking lot in Norway. An electric heating unit is provided for each car space. The driver plugs in, and his radiator water is kept at 60 degrees.



New Light Bulbs: Axial Filament . . .

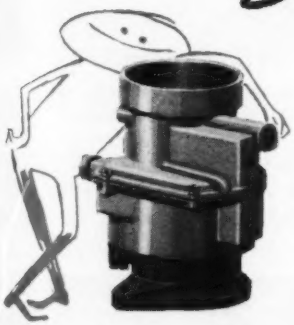
A SIX-PERCENT increase in light for household incandescent bulbs, 15 percent for high-wattage lamps, is in prospect with a new General Electric filament design. GE mounts the filament lengthwise (above right) instead of crosswise, as in the old bulb at left. This lets filaments burn hotter. New 750- and 1,000-watt sizes are ready now; smaller ones will be ready later on.



Three Lamps in One

TURN this bulb on, and its two incandescent filaments light, the mercury-vapor arc tube starts building up, and the fluorescent coating is activated by rays from the arc. The Fluomeric, developed by Duro-Test Corp., North Bergen, N.J., is rated at 12,000 hours.

QUIT "FUELING" AROUND.



Perfect partners in power! Rochester Carburetors are engineered for the newest high-compression engines.

No sense in playing "gas-ing" games! All fuels are fine—every one of today's high-octane gasolines delivers high-power, high-economy performance! But Rochester Carburetors are designed to really deliver the goods—to give you more performance, longer mileage between gas stops. So hop to it—specify Rochester when you're ready for a carburetor. Original equipment for Cadillac, Buick, Oldsmobile, Pontiac and Chevrolet cars.

CARBURETORS BY ROCHESTER PRODUCTS

ROCHESTER PRODUCTS DIVISION OF GENERAL MOTORS CORPORATION ROCHESTER N.Y.

Naked Eggs Keep Fresh Longer

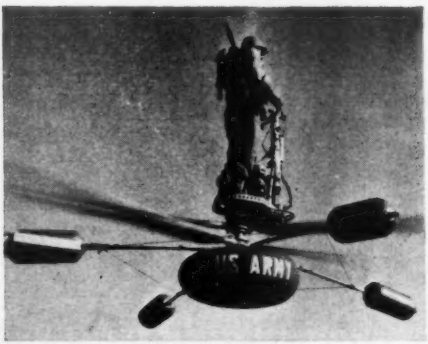
A WAY of packaging eggs in individual, sealed compartments, without shells, has been developed by Cornell University. The eggs, which will be marketed soon and may be cheaper, can be boiled or poached in their plastic containers.

Suction Plate Grips Workpieces

OUT of Germany comes an ingenious device for holding awkward pieces while working on them. It consists of a vacuum pump attached to a swiveling, tilting plate that adapts itself to uneven surfaces and can be adjusted for height.

Canvas Makes Car a Lightweight

CANOELIKE construction, with canvas stretched over a tubular frame, brings the weight of this little Czechoslovakian three-wheeler down to 600 pounds. A rear motorcycle engine drives the car at 55 miles per hour. It will seat two.



GI Tries Out One-Man Airlift

TWENTY minutes makes an inexperienced soldier a proficient pilot of the Aerocycle, a 150-mile-range rotor craft that he steers by leaning the way he wants to go. A two-cycle Mercury outboard hits 65 m.p.h. The Army has 12.

NOW... SPORTS CAR FUN IS FAMILY FUN!

The fabulous GOLDEN HAWK—275 hp . . . most power-per-pound of any American car . . . room for 5!

0 to 60 mph. in 8.7 seconds, 60 to 100 mph. in 17.7 seconds! Torque, 380 ft. lbs.—at 2800 rpm.; engine, 352 cu. in., V8; OHV; bore 4", stroke 3.50"; brake area, 195.3 sq. in.—biggest, safest, braking-to-weight ratio of any car. 4-barrel carburetion. Ultramatic Drive and all power assists available. Engineered to out-handle and out-run sports cars costing thousands more.

Now you can have the true sports car you've always wanted—and share the fun with family and friends! Take a look at that 5-passenger spaciousness, the luxurious appointments, the huge touring-car trunk—but don't be fooled. Behind that racing-type grille, under the sleek European styling is a *real* sports car—a hurricane of power that handles like a dream!

And there are four different Hawks to choose from—4 power choices, 4 degrees of luxury, 4 price ranges—including the lowest!

Put yourself in a Hawk—just for the fun of it—at your Studebaker Dealer's today!

Tune in "TV Reader's Digest" every week

Studebaker Hawks GOLDEN HAWK · SKY HAWK · POWER HAWK · FLIGHT HAWK

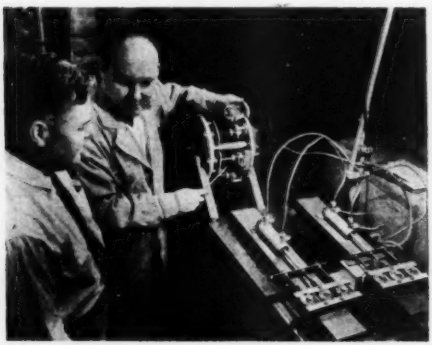
Studebaker Division, Studebaker-Packard Corporation—Where pride of workmanship still comes first!

Sign Helps Drivers Avoid Stops

EVER drive along one of those staggered-light roads and hit them all red? Not in Düsseldorf, Germany. The electric sign above is synchronized with the lights, whose timing is varied with traffic conditions. It tells drivers how fast to go in order to find them all green.

Gun Control Tracks Speedy Jets

THREE-INCH and five-inch U.S. Navy guns can pinpoint supersonic targets in any weather with this new Sperry Mark 63 gunfire control. It combines gyro-optic tracking with radar ranging and high-speed computation. The "talker" at left maintains gun-crew contact.



Machine Wears Out Padlocks

LOCK pickers may find their job tougher as the result of research with this machine, which puts 20 years' wear on combination-type padlocks in 24 hours. The Armour Research Foundation, which developed the device, hopes that it will help in the design of stronger locks.

Jeep Cleans Streets in a Jiffy

RUBBISH, from matchsticks to tin cans, is gulped up by a six-inch suction hose on this converted jeep Gutter-Vac. It does the clean-up job on Washington, D.C., streets six times faster than a man. A unit mounted at the rear chews up the rubbish and blows it into a burlap sack.

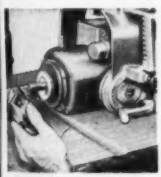
$239 delivered (saw blade and ¾ hp. motor included). EASY BUDGET TERMS

New 1956 AMF DeWalt "Power Shop" makes all home woodworking easy!

Here, in one big-capacity machine, is a complete home workshop . . . that gives you . . .

- The *power* you need for any operation
- 3-D versatility to handle any home project
- The *professional accuracy* to do any job quickly, easily, *expertly*
- The built-in *safety* you *want* in your home

See a demonstration of the new 1956 AMF DeWalt Power Shop at your dealer's today. Now more than ever, it's the finest, safest, most complete home workshop you can buy.



New ½ hp. direct-drive, custom-built motor. Rugged, reserve power for the toughest jobs — staying power for steady use.

Easy, safe, top-side cutting. Always see your mark and your cut — never work "blind." Saw moves above the work.

Straight-line material handling. Arm swings 360°. Motor rotates 360°—tilts past 90°. Material always moves straight on level table.

No floor space needed. Built into work bench, arm swings clear of work area . . . swings back when needed.

Exclusive New Shaper-Jointer Fence. Converts saw to a 2" jointer at ⅓rd the cost. Positions work for accuracy, safety.

Exclusive New Shaper Guard. A De Walt "First" safety accessory. Totally encloses knives and spindle—raises for adjusting work.

Another AMF Product

DEWALT POWER TOOLS

Complete versatility. Simply change tool on motor shaft. Your AMF De Walt saws, dadoes, shapes, sands, bores, routs, surfaces, joints. It buffs, grinds, turns, cuts curves . . . does *everything* in woodworking.

New safety. New safety key switch — one of many De Walt home safety features — turns power on or off. Take key with you and your family is completely protected.

SEND COUPON TODAY!

AMF De Walt, Dept. PS-56-3, Lancaster, Pa.
In Canada: De Walt Canada, Ltd., Guelph, Ontario

☐ **Please send me Free Colorful 20-page Booklet on how to do everything in woodworking . . . easily.**

☐ **Please send me Free plans on how to build a home workbench.**

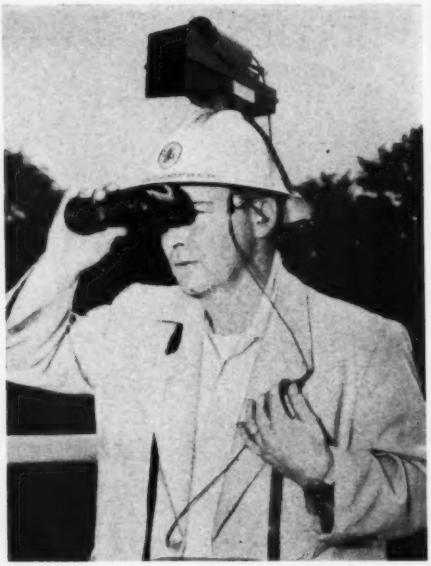
Name _____

Address _____

City _____ Zone _____ State _____

"Musical Chair" Plays Records

Two speakers in the wings of the armchair above provide recorded music for the seated young lady. The sound is limited: clear to the sitter, not heard a few feet away. The Telefunken Company, West Germany, developed the chair to replace booths in its record shop; found it popular. Now the company builds it to sell for use in the home.



He Wears Extra Eyes on His Hat

A SMALL 20-ounce detector on this ground observer's helmet gives him the position of an invisible plane at night or in fog. The experimental unit, built by the Air Research and Development Command at Rome, N.Y., picks up radar waves from an enemy bomber and converts them to a sound signal. The observer controls volume with a lapel knob.

Trailer Doctor Makes a Call

THIS shop on wheels packs a compressor, air and grease tanks, tires, ladder and pneumatic tools for servicing trailer trucks of the Pacific Intermountain Express Co., Oakland, Calif. Now the "yard doctor" works on trucks during loading and makes routine repairs that formerly took time in the shop.

IMP Tests Soldier's Ingenuity

DESIGNED to determine the energy used up by British Army recruits in basic training, this gas-mask-like device also tests the ingenuity of the Tommy above at tea time. The IMP (integrating motor pneumotachograph) collects and analyzes samples of exhaled breath, provides training and diet guidance.

MOTORISTS NEW and "HOT" ACCESSORIES

BE THE FIRST TO HAVE THEM!

HIGH COMPRESSION HEAD GASKETS
EXTRA-THIN .020" SOLID COPPER

These copper gaskets are only .020" thick it is the same as milling heads .040" to .050", and "hops up" the motor to give amazing acceleration power and mileage State exact year, make and model when ordering (If car is V8 type two gaskets are furnished at no extra charge)

Stock No. 21—POSTPAID **$4.95**

MELLOW TONE
Fiber Glass Packed MUFFLERS

Increases horsepower, increases gas mileage straight-thru construction, no back pressure, no high pitch irritating noises, deep powerful non-offensive tones. Specify make and model car

Stock No. 37—POSTPAID Each **$4.95**

NEW EXHAUST CUT-OUT

Exhaust tone is controlled from the dash Can be used as a cut out in the country and closed in restricted areas Or may be used to operate two different toned mufflers Well constructed of heavy plate steel Strengthens the exhaust pipe

UNIVERSAL— Fits All Cars

No. 66-POSTPAID Each **$3.42**

BERMUDA CLANGING BELL
It's the New "Rage"!

Gives a most amusing and commanding two-tone bell sound Easily installed under car floor by driver's seat Step on plunger Highly polished Fits any car

Stock No. 49— POSTPAID **$4.30**

AH-OOO-GAH Chromed HORN

Here it is for the sport car enthusiast Not a vibrator or other substitute but a genuine motor driven horn

No. 60— POSTPAID

State—6 OR 12 VOLT **$12.60**

REAR-VIEW MIRRORS

Special Curved Convex Glass Gives Curb to Curb Vision — Eliminates Blind Spots — Wider Range of Vision thru the Larger Windows of New Cars CURVED MIRROR—2½ x10" in Metal Case Painted a Neutral Grey Hammered Finish with a Plastic Rim to Match. POSTPAID,

No. 99—Fits all cars. Give exact year, make & model. Ea. **$2.94**

HI-SPEED ELECTRIC SIREN

Developed especially for the U. S. Navy & Coast Guard Now used by hundreds of Fire & police departments, busses, ambulances, etc. Complete with bracket, screws, 10 ft of cable & push button Green Enamel

No. 71— POSTPAID 6 VOLT **$13.24**

No. 91— POSTPAID 12 VOLT **$13.70**

NEW SOUND SENSATION
THE MUSICAL ITALIAN BUS HORN
Conversion Kit

Easily installed on all cars without special tools.

Electronic conversion kit that makes your stock horns yodel like an Italian Bus. Splits stock horn sound into two notes — one high— one low — about 10 times a second whenever you hit your horn Completely automatic Just 3 simple wire connections. Can be changed from car to car

State—6 or 12 VOLTS

No. 608 POSTPAID each **$6.95**

Custom Fit Continental Kits
$125.00 to $150.00 Values

How as low as ... **$49.95**

A Complete Kit (not a dummy kit) that carries the Spare Wheel Styled for Continental Look Simple 3-point installation Has self-adjusting toe-touch locking device for easy tire removal Full wrap-around gravel shields 20 gauge tire ring, full face plate and hardware for complete installation 100% rattleproof Baked prime finish Unit is pre-assembled Choice of prime or Stainless Steel Tire Ring Easy to install, no holes to drill When ordering state year, make, model of car and choice of solid or open face plate

Fits 49-55 Chev., Ford, 55 Plym, 53-54 Pont

No. 334—With PRIME RING **$49.95**

No. 335—With Stainless Steel Ring **$58.95**

Fits 54-55 Buick Linc., Merc., Olds 55 Dodge, Pontiac

No. 336—With PRIME RING **$58.95**

No. 337—With Stainless Steel Ring **$67.95**

DON'T GUESS
Have a DIAL AMMETER With Your RED AMMETER LIGHT

A precision gauge that tells how much your battery is charging or discharging For cars that just have a red light on the dash that flashes when you reach a high discharge rate This kit shows exactly the charge or discharge rate This is not a replacement for the "red" light but the addition that you have been looking for Fits all cars below the dash, without drilling any holes or can be mounted right in the dash Kit consists of Ammeter, Mounting Bracket, Ammeter shielded Light, all necessary wire, etc for easy installation Full instructions included

No. 554 Postpaid Each

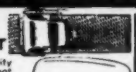
State—6 OR 12 VOLT **$9.95**

HOT SPARK INTENSIFIER

For all Cars Pops up all ignition systems Results in faster starting, smoother idling and better gas mileage Overall improved motor performance Attaches easily to your present coil without special tools Also improves high speed performance and stops plug fouling.

No. 519 Each POSTPAID **$2.49**

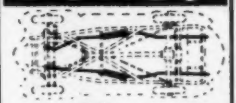
AUTO SAFETY BELT



An attractive, quality nylon safety belt that meets all standard requirements Fits all makes of cars With-stands tremendous stress and shock Attaches to frame of car Easy to fasten. Adjustable for baby as well as an adult with equal ease, and affords equal protection Complete with all hardware and instructions Available in white, blue, green, gray, maroon, black. Specify color desired

No. 309 —Each POSTPAID **$4.95**

DUALS

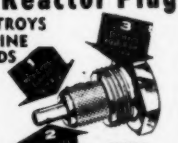


Dual exhaust systems guarantee more horse power, saves your gas, lets your engine breathe properly Eliminates costly back pressure Gives your car real-up-to-date "zip" Choice of regular, Hollywood Steel packed or Deep Tone Fiber Glass Mufflers All custom fit Easy to install with complete instructions Be sure to state year, make, model, body style of your car Also state if you have power brakes, power steering, standard or automatic transmission.

DUAL EXHAUST SETS

CAR & YEAR	No 265 Less Muffler	No 266 1 Reg Muffler	No 87 2 Steel Mufflers	No 267 2 Glass Mufflers
Buick 52-56	$13.75	$27.95	$31.45	$29.45
Cad. 50-51 exc convert	12.85	22.85	24.95	
Chev. 1955-56	11.35	17.89	21.85	21.25
Chrys 51-55 exc convert	18.75	42.50	34.45	
DeSoto 52-56 exc convert	13.95	39.45	29.25	
Ford V8, 35-52	9.75	15.25	19.85	19.65
Ford V8, 54-56	10.85	17.50	22.85	20.75
Lincoln 49-51	14.95	24.95	23.95	
Lincoln 52-56	19.98	40.35	42.75	
Mercury 39-52	10.45	17.35	19.85	20.35
Mercury 54-56	12.65	22.15	23.95	22.55
Olds. 49-52	12.65	19.95	23.85	22.25
Olds. 54-56	12.85	20.35	25.35	22.75
Pont V8 55-56	12.35	20.95	24.35	22.25
Plym. V8, 55-56	12.35	19.75	22.45	22.25
Stude. V8, 51-52	16.25	22.25	26.95	26.15
Stude. V8 53-54	13.25	21.15	25.95	25.15

Reactor Plug
DESTROYS ENGINE ACIDS



STOPS ENGINE SUICIDE

Replaces stock oil drain plug, extends engine life up to 200,000 miles Magnet draws out all metallic abrasives from engine oil insuring trouble free engine life. State year, make and model of car

Regularly $3.95.

No. 308—POSTPAID, Each **$2.49**

Bronze Porous OIL FILTER ELEMENT with LIFETIME GUARANTEE and Built-in Magnesium Acid Neutralizer

Porous bronze Element never wears out or needs replacement Lasts for a lifetime of the car Element removes all harmful particles yet retains your expensive additives Lets you drive up to 10,000 miles without changing oil Fits all cars except those with Full Flow Oil System listed below State year, make, model of car

No. 116—Regular $6.95. Element only POSTPAID **$4.95**

FOLDUP BRONZE FILTER ELEMENT FOR FULL FLOW OIL SYSTEM—Fits V8 Buick, Olds, DeSoto, 52-56 Plym 53-56, Ford, Merc 54-56, Chrys 51-56, Dodge 53-56, Ford '6' 52-56, Lincoln 52-56, Chrys exc V8 46-56 Chev 56 V8

State car, year and model

No. 117— POSTPAID, only **$8.95**

THE EDUCATED NUT

Pin-point adjustment nut for front wheels. Ten times more accurate wheel bearing adjustment it offers

- Safer, Straighter Driving Easily installed.
- Reduces wobble, sideplay & wheel slant.
- Permanent elimination of wheel balancing.
- Easier steering, smoother brake action
- Reduces tire "chopping" plus saving on tires up to 5000 additional miles per tire

The Educated Nut replaces the castellated front spindle nut on cars & trucks and provides a quick way to make precision bearing adjustments It consists of two sections with 84 points of adjustment instead of the usual six as on the ordinary castellated nut

No. 44— POSTPAID, Per Set **$2.95**

State year, make, model

Pacemaker "500" Flags

Self adhering! No holes to drill. Remove backing & apply, fits anywhere on doors, trunk, hood, etc. 4½" wide, 2½" high Die cast, Triple chrome plated with alternate black & chrome squares

No. 660 Postpaid **$1.49**

MINI Super Charger

Up to 25% more mileage & horsepower Fit all cars. Easy to install Built-in blower type impeller POSTPAID

Type Carburetors

No.	Throat	Each
311	Single	$ 9.95
312	Double	11.95
313	Four	19.95

State, year, make, model

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This giant 180 page catalog, packed with over 60,000 items for the automotive, truck, taxi, hot rod and custom car owner is yours FREE with any order for items selected from this advertisement. If you just want the catalog, send only 25c to cover part of handling and mailing cost (refunded on your first order).

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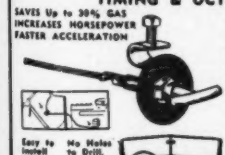
Control for Distributor
TIMING & OCTANE SELECTOR

SAVES Up to 30% GAS
INCREASES HORSEPOWER
FASTER ACCELERATION



- More Speed
- More Power
- More Economy
- Smoother Engine Performance & Control

Fine tune your engine while you drive. Gives you complete control of your distributor, you can easily advance or retard your spark, from inside your car while driving By a simple turn of a knob you can change the setting of your distributor, for better and smoother performances for all various kinds of driving, such as City driving, Highway driving at high speed, Heavy loads, Temperature and altitude Hilly or mountainous driving, wet, muddy and slippery pavement.

Easy to install, no holes to drill, no special tools needed, easy to follow instructions, will not interfere with present automatic advance & retard. FOR ALL CARS & TRUCKS

Easy to Install — No Holes to Drill. Mounts Anywhere on the Dash

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USE THIS HANDY ORDER FORM — MAIL TODAY!

JC WHITNEY & CO 1917-T23 Archer Ave., Chicago 16, Ill. Please ship following order on money-back guarantee of satisfaction

Quantity	Stock No.	Description	Price

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(NOTE: WE PAY POSTAGE on items marked POSTPAID when payment accompanies order You pay shipping charges on items not marked POSTPAID. If C.O.D. order, enclose at least 25% deposit, pay balance plus shipping charges upon delivery.)

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State—We car a s _____ Year _____ Model _____ No. of Cyl _____

Address _____

City _____ Zone _____ State _____

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REYNOLDS endorses NICHOLSON FILES for "Do-It-Yourself"* ALUMINUM

It's quick and easy to make things from aluminum with *ordinary home tools* when you use Reynolds "Do-It-Yourself" Aluminum. For most projects, you need only hammer, saw, shears and file.

The file is very important for removing rough edges which are formed when aluminum, like any metal, is cut or sawed. Some files do the job better than others, Reynolds has found. And the best files for the job are made by Nicholson.

For best results, ask your hardwareman for Nicholson files when you buy Reynolds Aluminum.

Nicholson 8" Handy File: double-cut side for fast metal removal; single-cut side for finishing. Ideal for aluminum and for wood, metal, plastic. **Not shown: 6" Half Round File,** for removing burs inside aluminum tubing after cutting.

Reynolds products and Nicholson-made Black Diamond files are also available in Canada

NICHOLSON FILE COMPANY
Providence, R. I.

NICHOLSON FILES

A FILE FOR EVERY PURPOSE

*T. M. Reynolds Metals Co.

Comic Strip Reports Aviation News

[Continued from page 170]

versity of Texas for three. In his dry way he says, "I was an impossible student. My first midterm at Texas I got two E's and two F's."

He lasted for 2½ years more, but only with some enforced time out, during which he studied briefly at the Chicago Academy of Fine Arts and took a $28 correspondence course in drawing.

Having always wanted to travel, Roy took advantage of his freedom, when finally bounced from college, to start riding the rods around the country. The 1922 railroad strike soon made that pretty tough, as the companies sent detectives out on their freights. Finding himself in Galveston, Roy shipped out as a seaman on a freighter. After a trip to Europe, he landed in New York.

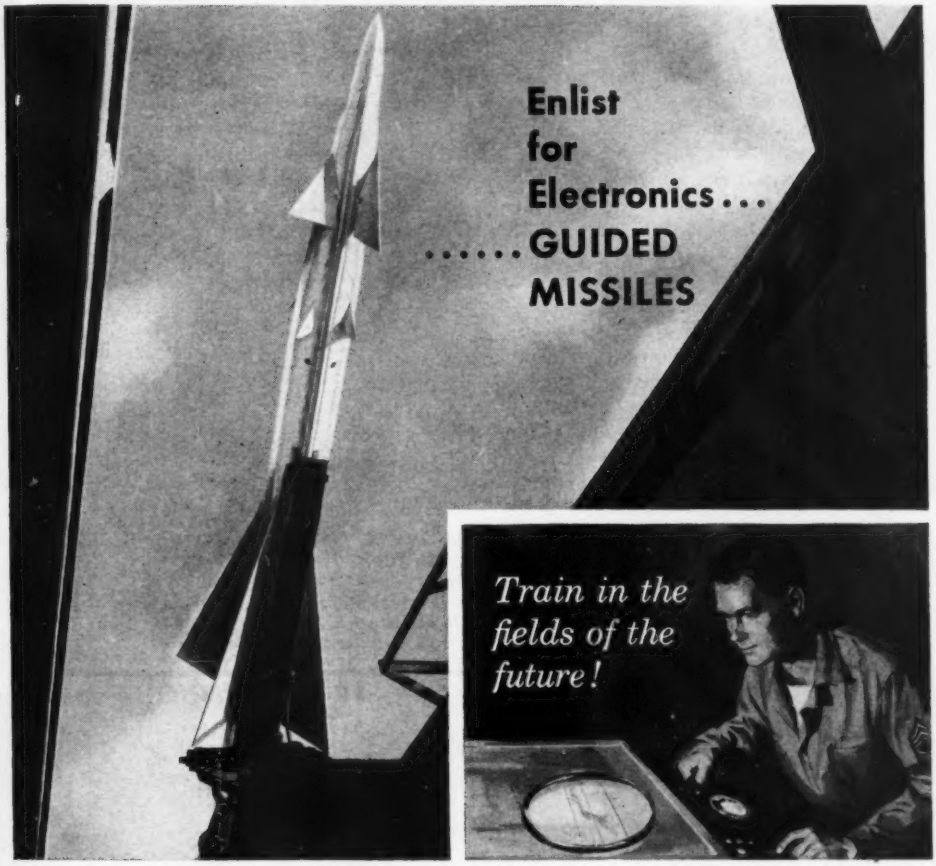
First strips. There he looked for a shore job as an artist and got one in the advertising department of the New York *World* at $12 a week. Soon he was looking around for ways to make more money, and he tried his hand at a daily cartoon panel. The syndicate he approached managed to sell it to only two newspapers at $1 a week apiece. Next he submitted his drawings to the Newspaper Enterprise Association in Cleveland. After several months, NEA offered Roy $50 a week to draw a daily strip.

That was in 1924, when comic strips were mostly gags, complete in a single day. All the cartoonists subscribed to humor magazines, and put their own twists on the jokes.

But Roy just couldn't think up gags. He spent hours at his drawing board listening to the trains one block away and the whistles from the ships in the harbor. The sounds got into his blood and he thought of shipping out. Finally he abandoned gags for adventuring—on paper.

A pal for Wash. With Wash Tubbs, a young man about his own age and billed as the hero of his strip, he roamed the world, pioneering adventure cartooning. Flying was not part of his material in those days. It came in later when Crane

[Continued on page 260]



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Training money can't buy—Here is training money can't buy! Instruction and equipment so advanced they are not yet available in most civilian courses. That's because the Army has pioneered the development of guided missiles and electronics for national defense. You benefit from this leadership with training designed to make you tops in your field.

ARMY ANTIAIRCRAFT COMMAND
"...PIONEERING TOMORROW"

New command—new opportunity—You'll take this training in the Army's latest, most modern command—the "command of the future"—the Army Antiaircraft Command. This is a young elite organization specializing in new supersonic weapons, and offering unlimited opportunities for advancement. Join these key men in America's future! To get in on the ground floor, apply *now!*

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Please send me further information on my opportunities in the new Antiaircraft Command.

Name .....

Address .....

City ..... **State** .....

[Continued from page 258]

was having trouble getting Wash out of scrapes because he was too small to fight. Roy's brother-in-law suggested that he introduce another character to help Wash fight. The result was Captain Easy, after whom that strip is now named.

In 1943, when Wash Tubbs and Captain Easy were riding the crest of the wave, Roy Crane left NEA, which owned the strip, to start a new one which he would own and sell through King Features, in New York. He decided to put the hero in the Navy because there were no other Naval aviation strips going. Before he began, he spent months planning and trying to do research, which, in the middle of the war, was not always easy.

Deadlines and ulcers. The manager of the syndicate he serves says that he has never known an artist who worked harder than Roy Crane. For years, Crane did all his own research and writing, and drew six daily strips and a Sunday color page all by himself. He finally developed ulcers. Now he has one full-time and two part-time assistants and is trying to take it easier and do more traveling.

Married for 27 years, Roy has two daughters. He modeled Buz Sawyer's sister after Nancy, the older one, who is married and has a four-year-old son. Cristy, Buz's wife, was modeled after Marcia, his younger daughter, who is single and was Miss Florida in 1952.

Crane's only hobby, besides traveling, is work. Even on trips, he loves to talk shop, sometimes until three or four in the morning. He gets his greatest kicks today from the acceptance of his strip by fliers, especially Navy men. Once a Navy pilot asked him if he had been a Navy pilot, too.

"When someone says something like that to me," he says, "I feel warm for a good time afterward." END

NEXT MONTH: Popular Science Monthly will introduce you to the man who wants to change your typewriter keyboard.

IT SMELLS GRAND

FRESH AND FRAGRANT AS A NORTH WOODS BREEZE

IT PACKS RIGHT

CUT JUST RIGHT TO PACK WITH EASE

IT SMOKES SWEET

COOL AND SMOOTH—IT'S SURE TO PLEASE

IT CAN'T BITE!

SIR WALTER RALEIGH'S BLEND OF CHOICE KENTUCKY BURLEYS IS EXTRA-AGED TO GUARD AGAINST TONGUE BITE.

FREE!

24-PAGE BOOKLET ON PIPE CARE. JUST WRITE TO: SIR WALTER RALEIGH DEPT. H6, LOUISVILLE, KY.

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Protect floor of your car and help keep trade-in value high with these twin Floor Mats. Cover entire front area, flat and slope. Designed to stay in place. Fit all cars. All new rubber. Black, red, blue, green, yellow. (2N1120-4).....From **$3.59**

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Portable Spotlight plugs into lighter socket . . . perfect for night repairs, finding house numbers, etc. Powerful 4½" sealed beam unit. All chrome finish. On-off switch. 10-ft. cord. 6 volt (2L6116).....**$5.85**
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Guaranteed leakproof, blowout-proof. Wizard Muffler protects against carbon monoxide gas fumes . . . gives "new car" silence to old engines. Original equipment specifications. Heavy, long-lasting steel. (T1148-1586) From **$4.95**

Wizard Tune-Up Kit makes it easy to "tune" ignition system. Complete kit with heavy duty points, condenser, rotor. Saves gas, makes car start easier, run smoother, perform better. Easy instructions. All popular cars. (L4600-32) From **$1.05**

NOTE: In some areas of the U.S., Hawaii, Alaska, and Mexico, prices slightly higher. Western Auto Associate Dealers own their stores, set their own prices, terms and conditions. (P536)

TRUE TEMPER. Tool News

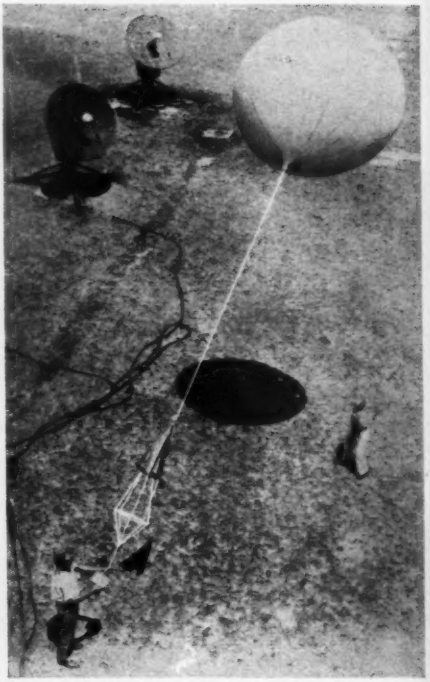
WORLD'S TOUGHEST HAMMER

Now you can get a heavy-duty 20-oz. ripper in the famous ROCKET model. It's a brute-strength tool—the most rugged hammer ever made. The tubular steel shaft won't bend or break. The head, locked to the shaft, can't loosen. It's the perfect hammer for electricians, plumbers and for all heavy-duty work—crating, flooring, framing, concrete forms, etc.

The nonslip cushion grip absorbs shock. This is the sweetest feeling hammer you ever swung. See all the ROCKETS—and True Temper's fine wood-handled hammers, too. True Temper Corp., Cleveland 15, Ohio.

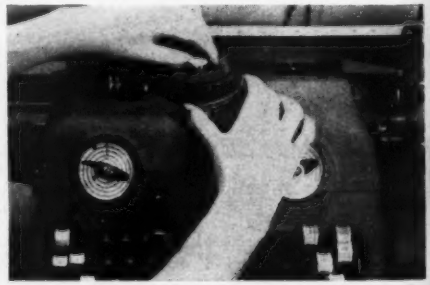
TRUE TEMPER.

Finest quality in Hammers, hatchets, axes • Garden, lawn and farm tools • Shovels • Shears • Fishing tackle • Golf-club shafts



Balloon Speeds Weather Data

CLIMBING at 1,800 feet a minute, this neoprene balloon developed by the Army Signal Corps rises twice as fast as the old "weather sack." Data gathered by radiosonde (foreground) is picked up by ground receivers (rear) and transmitted to a central station.



Machine Types in 50 Languages

BY CHANGING type plates, this machine's operator can type messages in 50 languages —without understanding them. She uses a transcribing code that matches numbers on the keys. The machine was developed for U.S. Army psychological warfare in the field.

Famous Antique Shop
uses and recommends
Klean-Strip Paint Remover

KLEAN-STRIP, the non-inflammable paint remover, is used exclusively by Leonard's Antiques, Seekonk, Mass., to restore the beauty of wood heavily coated with paint and varnish. L. C. Leonard reports "KLEAN-STRIP has far exceeded expectations . . . and exceeded results obtained with other removers used. We are sure it's the best."

KLEAN-STRIP works best for any refinishing job. It's fast-acting, easy to use, needs no neutralizing or afterwash. Buy it when and where you buy paint.

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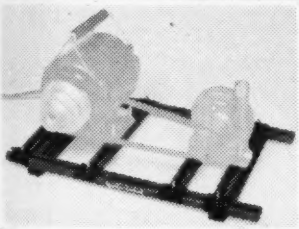
NON-INFLAMMABLE
KLEAN-STRIP
"PEELS OFF PAINT"



HARNESS YOUR HORSE POWER!

Universal Motor Mount

for the home workshop!

20-INCH SIZE $6.95 POSTPAID

Attention . . . workshop fans and farmers! It's brand new! The perfect method of mounting a motor and driven equipment. Easy to align pulleys and obtain correct belt tension in a jiffy!

It's sturdy, light-weight. Fits all motors up to 1 HP and small gas engines. Permits two-way movement of motor for use with sander, pump, compressor, generator, fan or other power driven appliance.

At your dealer . . . or write

ARCO MANUFACTURING CO.
DEPT. 20 GRAND FORKS, N. DAK.

CLEAN YOUR CARBURETOR
Feel the difference!

√ Smoother idling
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GUMOUT

- Cleans carburetors quickly and easily.
- Saves time and money.
- Nothing to take apart. Anyone can use it.
- Add it to your gas tank regularly . . . or have your serviceman run it through your carburetor.
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46-page
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Put Part of Your
Fuel Bill in the Bank!

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Do-It-Yourself
ALUMINUM
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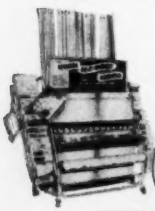
This aluminum foil bonded to both sides of sturdy kraft paper is as easy to handle as famous Reynolds Wrap.

All you do is staple it—or tack it—to your attic studding. Because aluminum reflects up to 95% of all radiant heat, this insulation keeps heat in, locks moisture out—saves dollars every month. (Attics are up to 15° cooler in summer, too.) *Call Western Union Operator No. 25 for the name of your nearest hardware or lumber dealer.*

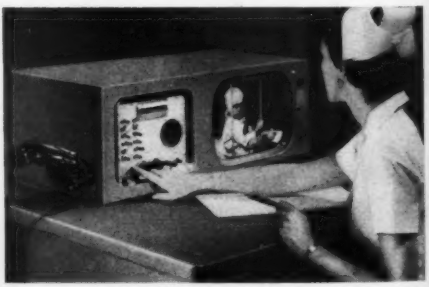


Look for this rack—Reynolds Aluminum by the makers of Reynolds Wrap

REYNOLDS METALS COMPANY
2493 South Third Street, Louisville 1, Kentucky
See Reynolds new show "Frontier"—Sundays on NBC-TV

Coveralls Now Air-Conditioned

AN EXHAUST fan in the back of a new rubber suit worn by Navy workers on contamination cleanup jobs keeps them cool by reducing inside moisture 40 percent in three minutes. The tiny unit is powered by a 1.3-volt battery that will operate for 24 hours.



Nurse Checks on Patient by TV

AT THE flick of a switch on this TV unit, a camera in each hospital room flashes the patient's picture to the nurse. A patient who wants privacy can cut the television connection but the nurse can still talk to him. Sperti Farady, Adrian, Mich., makes the device.

Squeezing More Power from Coal

[Continued from page 165]

enough temperature and pressure, there comes a point when the steam produced becomes as dense as the original water. At this "critical" point, problems arise which were once thought to be insoluble.

No bubbles or boiling. This barrier will be broken by the Ohio and Philadelphia plants now under construction. These "supercritical" plants have no conventional boilers. Hot water passing through the pipes will suddenly become steam without bubbling, boiling or expanding. With steam at the record-breaking temperature of 1,200 degrees, at a pressure of 5,000 pounds per square inch, for which the new Philadelphia plant is designed, previously used metals would melt like ice in July. So superalloy stainless-steel pipes will carry the steam to the turbines.

Under the intense heat of the steam, the walls of these pipes, which are 2½ inches thick, will glow cherry-red in operation. Pipes made of previous metals would have needed walls 16 inches thick, say the Philadelphia engineers, and even then might not stand the strain.

Power for 3,000,000 consumers. To prevent corrosion of pipes at the high temperature, a special process reduces the mineral content of the water to less than one part in 20,000,000, which would amount to about a tablespoonful in a standard swimming pool. The plant will burn 100 tons of pulverized coal an hour and is designed to produce more power from its fuel than any plant in the world.

Power engineers expect these new plants to act as bellwethers for further sensational cuts in fuel costs. "Just suppose we had rested on our 1925 laurels," says R.G. Rincliffe, president of the Philadelphia Electric Company. "Then it took two pounds of coal to make a kilowatt-hour. By 1965, to supply the expected demand for steam-electric power, we would be consuming coal at the astro-

[Continued on page 294]

Here's that new MAGNA JIGSAW

This big-capacity Magna Jigsaw has all the built-in features and precision you'd expect from the makers of SHOPSMITH®.

✻Exclusive *Twin-Tube Mount* for bench, Magna Power Stand, or SHOPSMITH. Time-saving *Instan-Tension* gives you convenient belt and tool height adjustment.

PLUS:

- Full 18" throat
- Ball-bearing shaft
- Quick blade tension
- Chucks index 90 degrees
- Swing-down arm for saber sawing

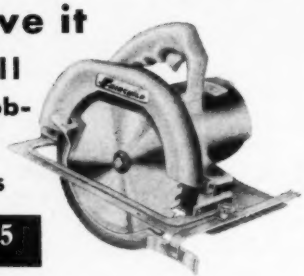
Only $49.95. Low monthly payments on Magna-Tool-Time-Plan. See the new Magna Jigsaw demonstrated at leading hardware and department stores or any Montgomery Ward store.

For free literature write Department 327-A, Magna Power Tool Corp., Box 2808, Fort Wayne, Indiana, or Menlo Park, California.

Only FAIRCHILD offers

a BIG 7-in. BLADE WITH FULL POWER to Drive it

PLUS all these Job-Tested Features



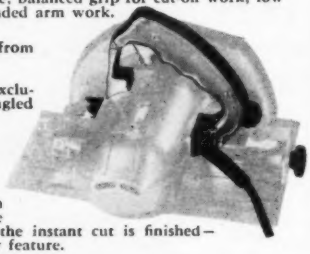
$39.95

It rips right through a *rough* 2 x 4 . . . *even at a 45° angle! That's* something *no* other popular price saw will do. No need for second cuts as with smaller blades. *AND . . . Only the NEW Fairchild Gives* All These Quality Features—

Saw balanced at trigger . . . no lifting or tilting. Handle gives extra comfort, safety. Thumb grip for vertical use; balanced grip for cut-off work; low grip for extended arm work.

Blade visible from *both* sides.

A Fairchild exclusive! Cord angled at 45° . . . prevents snagging, protects operator.



Spring tension snaps up the swing guard the instant cut is finished—another safety feature.

Depth and angular adjustment controls rear-mounted for ease and safety.

Same guide marker for *both* 45° and square cuts eliminates confusion and error. Balanced air stream keeps cut-line clear of sawdust without blasting or scattering.

Imagine! A full 7-in. heavy duty, builder's power saw, backed by the famous Fairchild name; a $55.00 value for only $39.95! See your dealer today or write for free literature.

CAMERA AND INSTRUMENT CORP.
FAIRCHILD Burlington, Vt.
Electrical Products Division

How to Keep Your Propeller Shipshape

[*Continued from page 107*]

different pitches, to guide you in experimenting with your prop.

What's the pitch? The pitch of a prop is the hydraulic equivalent of gear ratio. It is the axial distance that a propeller would travel in one revolution, assuming no slip. If for example you could take a prop having 10″ pitch and screw it into a large hunk of cheese, it would, in one turn, enter the cheese 10″.

Use the gauges by putting a prop on the checking fixture with the rear (pressure) side down. It should fit without shake on the center post. Spacers can be used to hold it any convenient distance above the plywood. Put each

. . . . . .

It's easy to get children to follow the straight and narrow path—all you have to do is live in a corner house and grow a nice lawn in front of it.

—THE SIDEWALK SUPERINTENDENT

. . . . . .

gauge on its proper diameter circle and move the blade face against the gauge edge when testing.

The curve of a blade may be changed by judicious use of a soft-faced hammer. Big changes (to be avoided as much as possible) can be managed with a lead hammer, working against a lead block as anvil. Go easy until you get the feel of the prop metal, and check repeatedly on the fixture. If you've had to reshape one blade considerably, relieve stresses in the prop by heating it in an oven for half an hour (350 degrees for aluminum or bronze, higher for steel). Don't heat a prop with a plastic sleeve in its hub.

Balancing. However skillfully pitched, an out-of-balance prop can shake your teeth loose. Test it either by setting the prop, placed on a snug-fitting shaft, on a pair of leveled knife edges; or by sliding the prop back and forth on a slightly looser shaft. Carefully file away metal from the heavy side. When a small paper clip attached to one blade will regularly make it drop, the propeller is pretty well balanced. END

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Buy your P&C tools from these famous blue, yellow and white merchandisers, in more than 10,000 stores coast to coast. Send 10c today for BIG TOOL CATALOG. P&C Tool Co., Dept. F1, Box 5926, Portland 22, Ore.

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3-IN-ONE Oil is the perfect way to protect planes, chisels, other fine tools. Forms a lasting shield of rust protection and leaves no gummy deposit.

"3-IN-ONE" OIL®

craftool DUSTMAN **takes the sawdust out of shopwork!**

NO MORE DUST!

NO MORE DIRT! NO MORE SWEEPING!

DUSTMAN gathers up all sawdust, wood chips, or metal shavings as they're formed and discharges them into a waste can! Keeps your shop spotless, the air pure and dust-free. Attaches to saws, sanders, multi-purpose tools, radial saws, portable tools.

SIMPLE! Plugs into any AC outlet. Fits on any ordinary waste can. Attaches to any wood or metalworking machine in minutes.

PORTABLE! Compact and easy to move from machine to machine when needed.

DURABLE! Extra rugged construction with no exposed parts.

See your power tool dealer or order direct from us. 10 day money-back guarantee.

SEND FOR FREE COMPLETE CATALOG P.

Complete with ⅓ HP CAP. AC ball bearing motor, hose, fittings and hood (wastecan not included).
4 Wheel Dolly - $9.50

CRAFTOOLS, INC.

401 BROADWAY • NEW YORK, N. Y.

You can Afford Expensive Ideas with

Fir Plywood

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... or this convenient built-in cooking center

WHEREVER you use it, fir plywood compliments your good taste. For built-ins, subfloors, sheathing or siding—for *any* building or remodeling job—it gives you lasting value and the look of luxury at a cost most pleasing to your budget. Created by nature, improved by man, fir plywood is wood made larger, stronger . . . better looking, more versatile.

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Grademarked for your protection, fir plywood comes in standard grades as well as special textured or overlaid panels. DFPA industry grademarks attest quality, performance and value.

Plans Available; See your lumber dealer or write (U.S.A Only) Douglas Fir Plywood Association, Tacoma 2, Wash., Dept. 11. Please order plans by name, enclose 10c for each.

From attic gloom to extra room!

NOW YOU CAN TURN that waste space into a cozy extra room with Gold Bond Insulation Plank and Ceiling Tiles. Use them in your attic, basement, house extension, or anywhere. They'll keep you warmer in winter, cooler in summer, too!

COSTS LITTLE. Gold Bond Insulation Planks come ready to install . . . no painting or papering needed. Just nail or staple them in place. Special edges hide the fastenings. You can choose ivory or a blend of four harmonizing colors. The cost? Far less than you'd think possible!

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FREE LITERATURE . . . Mail the coupon for Gold Bond Plan #14...complete illustrated instructions that show how you can build a room just as attractive as this!

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Please send me Gold Bond "How-to-Do-It" Plan #14, giving complete instructions on how to apply Gold Bond Insulation Planks and Tiles.

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Address_____

City_____ Zone_____

County_____ State_____

You'll Soon Ride Two-Headed Trains

[*Continued from page 126*]

Taming the curves. If you're a rail fan, you will probably be puzzled by one thing: How can this train, for all its low-hung coaches, make any better time than ordinary New Haven flyers if you sandwich it between two locomotives that, in center of gravity, are no different from the ones used today?

Here's the answer:

Train schedules, now, are not limited by the *safe* operating speeds of conventional equipment. They are held at least 40 miles an hour below that limit, out of respect for your personal comfort. The limits are set not to keep the train on the rails but the coffee in your cup. Talgo coaches can eliminate practically all of these restrictions, because the lurching movement is changed into an easy pendulum action.

For present equipment, the New Haven has enough slow-order curves between Boston and New York to make seven complete circles. But riding in the new Talgo, at higher speeds, a passenger will seldom even know when the train is going around a curve. END

New System Films, Files, Finds

A 60-TO-1 reduction squeezes 12 pages of information—and a complete filing code—onto this single Kodak "Minicard." To store or search out filmed information, the filing system's photoelectric eyes can scan codes on 1,800 cards a minute.

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ALL ITEMS Unconditionally GUARANTEED!

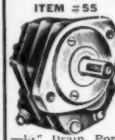
GROBAN
FOUR-WAY OPEN CENTER
HYDRAULIC
CONTROL VALVE

ITEM #126 — Four-way open center control valve, with built-in adjustable relief valve factory set at 1000 P.S.I. Spring loaded neutral position. For use with one double acting cylinder. In neutral position cylinder is locked and pump unloaded. Can be used as single unit or mounted in series. Has ¾" pipe thread inlet and outlet. 1½" pipe thread cylinder ports. Finger grip handle. Ship. wt. 10½ lbs.

AN OUTSTANDING BUY!

F.O.B. Chicago **21.50**

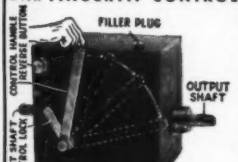
MULTI PURPOSE
HYDRAULIC PUMP OR MOTOR



ITEM #55 — Silent, high efficiency, Helical Gear Type Ball Bearing, Hydraulic Pump or Motor. Rated 8 Gal. Per Min. At 1500 R.P.M.—delivers 1000 P.S.I. Using 6 H.P.—Reversible Rotation—¾" Pipe Thread Inlet and Outlet Ports —1¼" Drain Port—¾" shaft with keyway and flat for either direct or pulley drive. Dimensions—5⅜" high, 7¼" long, 5⅛" wide. Shipping weight 18 lbs.

F.O.B. Chicago **45.50**

GROBAN HYDRAULIC
SPEED REDUCER
with FINGERTIP CONTROL



Item # 115

FOR: ● Reamer Drives ● Midget Cars ● Feed Mills ● Canning Machines ● Conveyors ● Lathes ● Milling Machines ● Motor Boats ● Cream Separators ● Garden Tractors ● Pumps.

Variable output speeds from 0 to input speed available by moving control handle. Locking handle maintains setting. Use input power of ¼ to 1½ H.P. Shafts ⅝" diam. Input rotation—counter-clockwise facing shaft. Input speed 750 R.P.M. 7½" x 7½" x 11½". Gov't acquisition cost $428.00. Shpg. wt. 31 lbs. Complete with 2 qts. of oil and full instructions.

F.O.B. Chicago **54.50**

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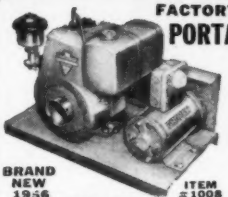
PORTABLE ELECTRIC LIGHT PLANTS



POWER TO OPERATE:
● Electric Saw, Electric Drills, Pipe Bender.
● Refrigerator, Deep Freezer, Incubator.
● Water Pump, Radio, Lights, Air-conditioner.

BRAND NEW 1956 — ITEM #1008

COMPACT—FITS IN THE TRUNK OF YOUR CAR

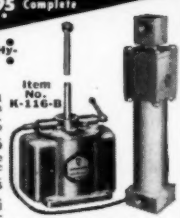
1000 WATTS OUTPUT, continuous duty. 115 Volts A.C. 60 cycles, 9 amps. Powered by husky, easy starting Clinton engine. Engine and generator operate at 3600 R.P.M. for maximum efficiency at minimum weight. Both units are mounted on steel base, with heavy sheet metal belt guard. Generator is self regulating, and is equipped with outlet box containing fuse and 2 A.C. convenience receptacles. Cost only 5c an hour to operate. Dimensions: Length 20½", Width 12", Height 16". Shipping wt. 100 lbs. F.O.B. Chicago..... **149.50**

700 WATT—GENERATOR SET—same as above, slightly smaller—with Briggs-Stratton Engine—Model 708—F.O.B. Chicago..... **129.50**

Brand New! 5-TON BLACKHAWK
HYDRAULIC LIFT KIT

Now Only **38.95** Complete

THE COMPLETE KIT
For— ● Dumping farm wagons ● Adjusting depth of plows ● Hydraulic press ● Hydraulic jack ● Snow plows.



Item No. K-116-B

KIT CONSISTS OF:
1—Brand new Blackhawk Model P-151—Hydraulic hand pump with built-in oil tank and release valve. Rated from 1200 P.S.I.—to 8400 P.S.I. 20" handle. Dim. 8"x6"x6". **Item #82**..... **22.50**
1—6 Ft. length double wire braid rubber covered hydraulic hose—tested to 20,000 lbs. **Item #2784**..... **3.95**
1—Hydraulic cylinder. 2" bore. 6" stroke, husky 1" solid steel shaft, will lift 10,000 lbs., using pump pressure. Standard clevis mounting. May be used for double action service. **Item #41C1C**..... **12.50**
2-Qts. non-foaming hydraulic fluid..... **1.00**
All necessary hydraulic fittings.
Total ship. wt.—40 lbs.
COMPLETE KIT PRICE..... **38.95**
ALL OF ABOVE INCLUDED F.O.B. Chicago

Brand New—U. S. Navy Cost $146.00
OBERDORFER Self-Priming BRONZE PUMPS

Item No. 324

For:— ● Water Pumping ● Sprinkling ● Insecticide Spraying ● Sump Pump ● Fuel Transfer—Rated Speed—500 to 2000 R.P.M.—Perfect for P.T.O., Direct or Belt Drive. Output —63 Gal. Per Min., 150 P.S.I.—use ½ to 6 H. P.—1¼" Pipe Thread Ports. 2 Grease Cups included. 1" Solid Bronze Shaft—Shipping Wt. 38 Lbs. Save 118.50 F.O.B. Chicago..... **27.50**

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A. C. ELECTRIC
GENERATOR

ITEM #G-75-D — 7½ K.W. (7500 WATTS) single phase, 110/220 volt output. 3 wire system, 2 bearing construction. 5 groove 6" V belt pulley included. Self-excited. Foot mounted. Drive generator from tractor or stand by engine. Ample power for 6 room house. Dimensions: 34" x 11½". Shipping Wt. 420 lbs.

F.O.B. Chicago **295.00**

Complete control box for these generators includes A.C. rheostat, automatic voltage regulator, field rheostat, and voltmeter, already wired and ready to connect to generator. List price $167.00. Our Price **56.45**

BRAND NEW 1 H.P.
12 Volt Electric Motor

ITEM NO. 308

● For electric wheel chairs (Pop. Mech. design—Mar.-'59).
● For electric golf carts.
● For self-propelled scooters, children's midget cars.

Rated 1 H.P.— 100 amps., 5600 R.P.M., 12 volts, D.C. — This double shaft motor of ball-bearing construction may be run on 6 volts for lower horsepower requirements. —Standard ⅝" shafts, nut and bolt electrical terminals, flange mountings—Dimensions: 9" x 4½" x 4½" Ship. wt. 19 lbs.

A real value at..... **12.50**

F.O.B. Chicago

BELT DRIVEN
A. C. GENERATORS

ITEM #700

Ideal for powering electric tools, oil burner, refrigerator, lights, or other appliances requiring up to 700 watts of power. **700 WATTS**, 115 Volts, 60 cycles A.C. 3600 R.P.M. Compact, self-regulating generator with V Belt pulley and double outlet receptacle. Rotation counter-clockwise. May be driven by tractor or auxiliary gasoline engine. Requires 2 HP minimum. Dimensions: 10" long x 8" high x 6" wide. Shipping wt. 27 lbs. F.O.B. Chicago **59.50**

Model 1010, 1000 WATTS
Same as above.
F.O.B. Chicago..... **79.50**

DOUBLE ACTION
HYDRAULIC CYLINDER

ITEM #31C—3½" bore, 11" stroke. Alloy steel cylinder wall. Micro-Honed and all steel 1⅛" diameter piston rod. 19½" overall length closed. Clevis mounting at base and shaft. Will lift 9625 lbs. with 1000 PSI Pump Pressure. Uses ¾" tubing fittings. (Fittings to pipe thread: two ¾" MPT @ 35c.) A $102.00 value. Shipping weight 11 lbs. FOB Chicago..

25.00

ELECTRIC WELDER
AC or DC 110 Volt

The "Little Marvel" all-metal welder. 5-year written guarantee. Welds ⅛" metal or money back. Repairs tanks, tools, fenders, machine parts, etc. Complete with everything—rods, unit, eye shield, directions. $6.95 plus 50c postage. Flame torch accessory for soldering, cutting, brazing $3.95 complete with carbons, brass rods, flux. $2.00 deposit on C.O.D. 75 Ampere ¼ inch Transformer Welder $21.95 F.O.B.

$6.95 Complete

ESSAY MFG. CO., Dept. 47, Quincy 69, Mass.

ONE-MAN SAWMILL
LOW AS $50.00 DOWN

Take BELSAW Portable Sawmill right to the trees—turn out valuable lumber for home and farm — sell to local yards — make up to $50 a day custom sawing for neighbors. BELSAW lasts a lifetime. No crew needed. Power with tractor or auto engine. Beginners get excellent results. Send today for FREE BOOK.

FREE BOOK

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Kitty Kimsul says:

"Here's the easiest insulation of all to cut, measure and install!"

• KIMSUL Insulation is designed to cut winter fuel bills up to 33%—to keep your house up to 20° cooler in summer.

• And KIMSUL is clean—free of irritating dust and slivers.

• So light and compact even a woman can carry a 200 ft. roll—or take home enough in the car to insulate an entire attic.

At your Kimsul lumber dealer's—this denim cobbler's apron. Regular $2.50 value—only 89¢

Perfect for hobby work, gardening, barbecuing. Has three large pockets, adjustable waist and neck bands. Only at your KIMSUL lumber dealer's and only for a limited time.

KIMSUL INSULATION — A PRODUCT OF Kimberly-Clark

Kimberly-Clark Corporation • Neenah, Wisconsin

The Four Ways to Remove Paint

[Continued from page 225]

try another trick. Spray it on instead, using a hand-operated insect sprayer—Flit gun. But first slap newspapers over anything around that needs protection.

Give the remover time to work. A typical paste remover needs at least five minutes on lacquer, varnish, or shellac; and anywhere from 20 minutes to several hours on most kinds of paint.

Test the result with a putty knife. If the entire finish, no matter how many coats, will not come off at one time, stop. Wait a while and try again. If necessary, put on another coat of remover. Apply it in the same manner.

When the old finish wrinkles and lifts easily, take it off with a putty knife, followed by steel wool. Go after crevices and curves with steel wool or a wire brush. Tough places in furniture legs and other turnings can sometimes be reached best with strands of twine or burlap. You can make scrapers to fit moldings by clipping them out of light sheet metal.

Those are the standard procedures. When they don't work well enough, try some tricks: soak up messy jobs by sprinkling on coarse sawdust; even set fire to a final coat or remover. (But do this only if you're working outdoors, have taken proper precautions, and are covering only a square foot or so of surface at a time.)

If you're taking finish off a really fine piece of furniture, you may want to skip the putty-knife job entirely to avoid possible gouging. Wipe with burlap instead.

Always use solvents. Do you need to wipe the surface with solvent after the old finish is gone? Most labels say no. Most experts say it's a good idea no matter what the label says.

There's a new and important factor today that makes the solvent wipe more important than it used to be. This is silicone furniture polish. If there is any likelihood that the piece you are refinishing has been polished with a silicone, give it a really thorough cleaning—particularly if you are going to lacquer it.

[Continued on page 274]

PORTABLE LIGHT PLANTS

GIANT 2000-2500 WATT PLANT

110-120 v. 60 cyc. AC, absolutely the best made — exclusive dynamically balanced armature; heavy windings develop up to 5000 watt overload for motor starting. Skid mounted — portable. Powered by an easy starting Briggs or Wisconsin 6 HP engine—complete with all accessories: engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty. (Item 31) Wt. 210 lb. Reg. price $585. Special at..... **$299.50**

EXTENSION CORD

Heavy duty and very flexible, Neoprene 14-2 cable. 20 year quality. Wt. 12 lbs. (Item 185) 100 ft. Complete with rubber plug and outlet. A terrific buy at only **$8.95**

JET STEAM MASTER

Now, a super efficient portable steam generator that produces live steam at 100 lbs. pressure in 60 seconds from a cold start! Produces large volume of high pressure steam on 2 pints of fuel oil. Instantly cleans sticky grease, dirt, rust, old paint, etc. off implements and road machinery. Pays for itself in a few weeks. Sterilizes soil; Sterilizes as it cleans—milk equipment, etc. Fully automatic—oil fired with new, built-in lifetime bronze water circulating pump. Draws water from faucet or bucket. Simple and safe—anyone can use it; built-in safety valve. Complete with 12 ft. of hi-pressure steam hose and new triple efficiency steam gun that automatically mixes in soap solution if desired. Wt. 230 lbs. Item 463. Special factory price..... **$329.50**

get **BEDROCK** factory prices from **MASTER MECHANIC**

(Item 24)

600-700 WATT PLANT

PUSH BUTTON START

115 v. 60 cyc. AC Powered by a rugged 2 HP, easy starting Briggs engine. No wiring necessary; just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc. which require up to 700 watts. Ideal for television and radios. Complete with voltmeter and built-in winding to charge 6 v. auto batteries. (Item 24) Wt. 75 lbs. Easily fits in car trunk. Be prepared if storm knocks out power lines. Regular $275.00 value..... **$143.50**

1000-1200 Watt Plant (Item 45) same as Item 24 but larger generator and engine with 50% greater output..... $199.50

1300-1500 WATT PLANT

115v. 60 cyc. AC Push Button Start. Powered by a 3½ HP. Clinton engine. Combines big output with easy portability. Provides emergency power for operating any oil burner, sump pump, freezer, television, lights, communications systems, etc. which require up to 1500 watts. (Item 22). Wt. 110 lbs. Reg. $475 value. Factory price... **$239.50**

1750 Watt Plant Powered by 4.5 Briggs engine. Electric starting & battery charging built-in! Factory price... **$279.50**

Dual Voltage 110/220 available for above plants for $30.00 additional.

We make every type and size of light plants —Write, giving us your requirements!

HEATING & VENTILATING FAN

(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range removes kitchen smoke and odors. Powerful, continuous duty motor, 110-120v. AC. Mount in wall or ceiling to ventilate any area. Quiet, super-efficient fan moves huge volume of air. (400 to 600 CFM).

8" Pipe, wt. 5 lb..... **$6.85**
9" Pipe, wt. 6 lb..... **$7.85**
10" Pipe, wt. 7 lb..... **$8.85**
12" Pipe, wt. 8 lb..... **$9.85**

HEAVY DUTY FAN. Semi-enclosed motor, suitable for spray booths, restaurant exhausts, poultry houses, etc. 10" Fan, wt. 8 lbs. (Item 10E)..... **$11.95**
12" Fan, wt. 10 lbs. (Item 10D)..... **$12.95**

HI-FLO Centrifugal PUMP

Completely self-priming! No foot valve required. Tremendous capacity—100 gal. per min. ! . . Special impeller enables pump to handle muddy or sandy water. Simple to operate—simply start engine and watch the water go. Powered by a rugged, easy-starting 2 HP Briggs engine. Prelubricated sealed bearings for years of heavy low-cost service. **Big 1½" Model.** Item 502. Wt. 70 lbs. Factory price... **$134.50**

2" Model (150 gal. per min.) with 2½ HP engine. Item 502a. 90 lbs. Fact. Spec. **$154.50**

with mounting flange (Item 38)

HEAVY DUTY D-C ARC WELDER

Use as portable or shop welder. Up to 300 amps. Senior model. Made for years of trouble-free, continuous service. Will handle light or heavy jobs. Easily welds up to ¾" plate using ¼" rods. Built-in air cooling system. Arc is easy to strike and hold, because of specially designed arc stabilizer. Hi-lo switch and dial control gives wide range of welding heats. Run welder at 2600 rpm. with tractor, jeep or 15 hp. gas engine, or 7 hp. elec. motor. Complete with instructions, guar. and triple V belt or flat pulley. You can buy more, but you can't buy a better welder. Wt. 110 lbs. $400 value **$119.50**

WELDING KIT Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at.. **$10.50**

Send check or M.O. Prices f.o.b. Factory. 10 day Money back guarantee. SEND 10c for ... *BIG 1956 Catalog*

MASTER MECHANIC MFG. CO., DEPT. 29-M **Burlington, Wis.**

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Just off the press, this valuable folder describes the various grades of West Coast lumber together with their appearance and uses. Also shows new grade stamps, patterns and actual sizes of all commonly used West Coast lumber. A handy reference guide for any hobbyist or do-it-yourself builder.

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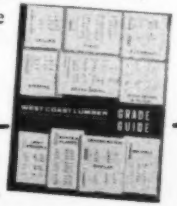

INCLUDES INFORMATION ON THE NEW GRADE NAMES FOR WEST COAST LUMBER EFFECTIVE MARCH 15, 1956

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for quick clean cuts . . .

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Heavy-Duty Pipe Cutter

Powerfully built—guaranteed not to warp or break, always tracks perfectly . . . Famous RIDGID thin-blade or heavy-duty cutter wheels of tool steel roll easily, cleanly through any pipe. Special wheels for stainless steel, cast iron. Every cutter factory-tested. For your work or home, it's most for your money—buy it at your Hardware Store!

RIDGID
Work-Saver Pipe Tools

The Ridge Tool Company, Elyria, Ohio, U. S. A.

The Four Ways to Remove Paint

[Continued from page 272]

Otherwise you're asking for those nasty blemishes that the pros call craters or fisheyes.

The wipe can be with any common solvent. Alcohol, turpentine and lacquer thinners are okay. If you have reason to suspect silicones, make it at least two wipes, each with a clean cloth. If there are deep gouges or burns in the surface, enough silicone or even wax polish may have penetrated to make trouble. Blot it out by poulticing the area with a paste of fuller's earth or clay wet with turpentine. Let it dry, remove it, then blow it out thoroughly.

And remember that even the dust from sanding is a potential menace to a lacquer job if a silicone is around.

Dodging the issue. Not one of the methods of depainting is either easy or fun, so it's worthwhile to sneak out of the job if you can. Sometimes you can.

If the surface is to be repainted and is in good condition, you can use one of the cleaning and de-slicking liquids instead of taking off all—or any—of the old paint. About all you have to do is wet a rag with the fluid and wipe the surface. This takes off wax, grease and dirt; it also softens the old finish just enough to give it a tacky surface that new paint will cling to without creeping.

Another advantage of this system over sanding is that it gets to the difficult places, such as grooves in moldings, that are mean to reach with sandpaper. If the old paint has been heavily waxed, use (instead of a rag) 00 steel wool dipped in the fluid. END

Collector's Item

The collection department of a Chicago firm tried a new method on a slow-paying account in a small town.

"Dear Mr. Smith," the letter began, "what would all of your neighbors think if we came to your town and repossessed your car?"

In due course, the letter came back with this note across the bottom, "I have taken up this matter with my neighbors, and they think it would be a lousy trick."—*The Injector.*

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LEVELS

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DURABLE

HIGHLY ACCURATE . . .
UNBREAKABLE FRAME . . .

PRICES START AT $4.65

First of its kind ever offered at so low a price! Extruded magnesium I-beam construction, with replaceable vial assemblies . . . extra large, glass windows for fast, easy readability in both plumb and level positions. Home handymen can choose the 18, 24, or 28-inch size.

AT YOUR DEALERS, or write
J. H. SCHARF MFG. CO. 6120 Binney, Omaha, Nebr.

NOW - THE QUICK-WAY TO SHARPEN ALL CIRCULAR SAWS

NEW

Model PG-12 Complete No extras to buy. **$16.50** Postage Paid

Model PG-12 sharpens, joints, gums, and retooths all cross cut, rip, combination, miter, and planer blades up to 12" in diameter. Two precision index plates give versatile, accurate sharpening. Guarantees precise spacing of teeth. New safety rest prevents tilting and gouging of blade. Save time and money. Special $3.00 grinding wheel also included for use on your own power table. Fits regular or radial swing tables.

Order today. Send check, cash, or money order. We pay postage.

QUICK-WAY SAW CO.
100 Hornby Drive, Painted Post, N. Y.

Paint STRIPES with New "PAINT PEN"!

Straight, Curved or Parallel Lines

Use like a fountain pen with any color paint to stripe furniture, bikes, autos, model planes, toys, linoleum, wall board. Beautiful clean, crisp results every time. Can't clog or smear. Also use with glue, tempera, textile paint or ceramic under glaze. Paints on wood, glass, plastic, metals, fabrics and paper. Tool complete with tip for 1/16" stripe only $1.25 postpaid. Other complete tools with following tips, 1/64", 1/32", 3/64", 5/64", 3/32", ¼"—$1.75 each. Extra tips 90c each. Entire kit with tool and 7 tips—$5. A ¼" tip only $1.20 each. C.O.D.'s postage collect.

New! "DOUBLE-STRIPE" 5 Way Combination Model only $3.25
Double Stripes—one wide and one narrow or two wide or two narrow at the same time.

FREE Send postcard for complete information—or ORDER TODAY.

$1.25

DEALERS: Master Paint Striping Tool in display cartons of 1 doz. FAST, PROFITABLE SALES. Write for new discounts.

HOME CRAFTSMEN! New Paint Striping Tool gives "professional" results every time, simple, easy to use. Send $1.25 now.

MANUFACTURERS: Write today for information about industrial models and production striping tools.

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air-cooled
gas engine drive

"Husky Boy"
arc welder

welds anywhere

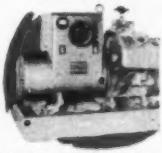
earns bigger profits

A small investment puts you in business!

"Husky Boy"

"Husky Boy" 200 amp. welder driven by a 2 cylinder air-cooled engine. Perfect for outside or around the shop welding. Handles the big pay jobs.

200 Amp. AC Welder-AC Power Combination, four cylinder air-cooled engine. Furnishes 200 amperes of welding current and 5,000 watts of AC power alternately. Easily mounted on your truck or trailer for quickly getting to where it's needed on a moment's notice.



AC Power—AC Welding

AC Power or AC Welder. An excellent dual purpose combination available in 200 or 300 amp. welding sizes. Can be belted or coupled direct to your own gas engine.

AC Power—AC Welding

Transformer Type AC Welder 250 amp. A real welder for production and repair work in shops that have only single phase power available.

AC Transformer

Investigate these money makers today!

Fill out and mail coupon for complete information on these machines—learn how they can earn bigger profits for you.

Hobart School of Arc Welding

Learn arc welding quickly by actual on the job experience at the non-profit Hobart Trade School. Complete or partial courses. G. I. approved.

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"One of the world's largest builders of arc welding equipment"

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Mammoth 1956 Wholesale Tool Catalog

TOOL CATALOG

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I am enclosing $1.00. Rush me your dealer's card and big Catalog Today. If I am not completely satisfied with your plan, I understand that I can return the Dealer's Card and Catalog for refund, and if I decide to order, my $1.00 will be deductible from my first order.

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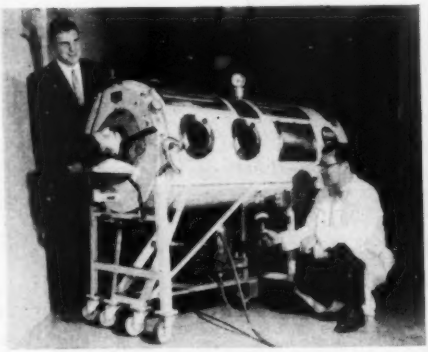
Four Lamps Aid Indoor Movies

THIS four-light arrangement makes it possible to shoot indoor color movies at one aperture stop down and thus get more depth than with the customary two-light bar. Or you can cover a greater area using the same stop. A removable hand clip on the Kodak Brownie bar lets you position the lights. Two of the lamps may be switched off.



Iron Lung Is Air-Conditioned

AIR diffused throughout the inside of this mechanical respirator keeps a patient comfortable and may reduce possible fever damage to his nervous system. The unit, planned by a member of the University of Illinois' hospital staff, has a compressor and motor similar to a window air conditioner.

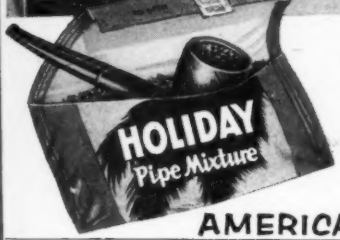
AMAZING PROOF*

YOU CAN'T MATCH HOLIDAY PIPE MIXTURE

EVEN AT $6.00 A POUND

CUSTOM BLENDED FOR MILDNESS

More men every year switch to Holiday, because it contains these five famous tobaccos from all over the world skillfully blended into a mixture of unequalled flavor, aroma and mildness. Each tobacco adds its own distinctive flavor and aroma, to make Holiday America's finest pipe mixture. Try a pipeful—enjoy its coolness, flavor and aroma—and see for yourself why more and more men who smoke mixtures are switching to Holiday as a steady smoke.



***PROOF from an EXPERT**

The custom blender in a nationally famous tobacco shop was asked, "Can you duplicate this tobacco?" After examination, he said, frankly, that *he couldn't guess the secret of the blend*, although he could supply the types of tobacco used at $6 a pound!

LARUS & BROTHER CO., INC., RICHMOND, VIRGINIA

AMERICA'S FINEST PIPE MIXTURE

WORN ENGINE BURNING OIL!

Reduces oil bills!
Restores compression!
Increases miles per gallon!

Forms self-lubricating seal at piston top. Inserted through spark plug holes. Used by millions of motorists. Tested and approved by motoring experts.

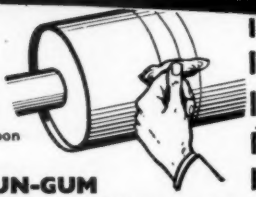
$4.95 Tube for most cars

*PISTON SEAL

Holt's HAVE THE ANSWER!

REPAIR MUFFLER AND EXHAUST LEAKS in 10 min.

The plastic gas-tight seal sets hard, withstands heat and vibration. Prevents carbon monoxide gas poisoning.



$1.69 TRY CAN

Holt's GUN-GUM

*MUFFLER PLASTIC SEAL

SETS LIKE A WELD — NO TOOLS NEEDED

At Auto, Accessory and Montgomery Ward Stores

TREGLOWN CO. INC, FANWOOD 64, N.J.

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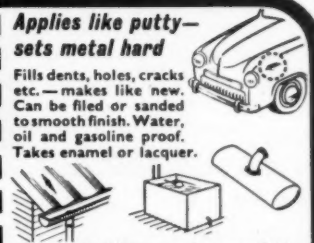
Applies like putty—sets metal hard

Fills dents, holes, cracks etc.—makes like new. Can be filed or sanded to smooth finish. Water, oil and gasoline proof. Takes enamel or lacquer.



Loy Cold Metal— 8 oz. can $1.29

LOY pat. pending COLD METAL

LOY in tubes Handy cold metal for all repairs. Cheap—easy—no heat or mixing. Tube $1.00

LOY SOLVENT Thins Loy Cold Metal for brushing or spraying. 2 oz. jar .59

LOY TWIN PACK 8 oz. Can Metal, 2 oz. Jar Solvent. $1.79

New low heat metal filler—melts into place—sets instantly!

Fills holes and dents. Needs only low heat from special electric paddle, soldering iron, etc.

INSTANT LOY

Stick .60—Dozen $6.95

Write for Full DETAILS

Even the sound a Disston saw blade makes as it cuts is something special.

That's because Disston craftsmen build special quality into every blade at every step—from the fine Disston-made steel to the finished product.

There's so much extra satisfaction in using good tools, remember to ask your hardware dealer to show you Disston

- **Circular saw blades and dado heads**
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- **Hand saws**
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- **GET THIS FREE TOOL MANUAL!**

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Please send me, free, illustrated 68-page booklet. It tells how to choose, use and care for tools.

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Airline Tests Emergency Exit

TESTING this airplane escape slide at Pan American's Miami lab, volunteers are checked off as they make 500 exits over the vinyl-coated nylon surface. Designed to be used only once, if ever, for passenger and crew escape during a landing or take-off emergency, the flame-resistant slide unfolds to anchor at an easy incline to the ground.

Machine Can Type Whole Words

PRESSING a foot switch and a single key causes this experimental IBM electric typewriter to type out any one of 42 words or phrases of up to 18 characters each. The typist selects the words and corresponding keys by resetting the wires that lead to a control panel in the left desk drawer.

Speedy Sprayer

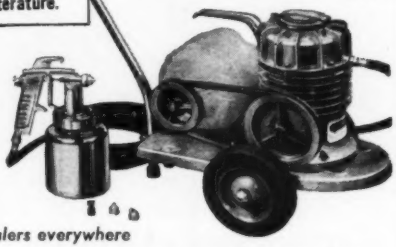
mobile paint sprayer

Choice of craftsmen for 35 years! Saves time, paint and money. Quickly gives flawless finish to walls, furniture, screens, fences and handiwork. Sprays all materials; ¼ H.P. motor. Diaphragm principle assures clean, oil-free air. Never needs lubrication. With gun, less motor.

No. 890 Speedy Sprayer $38.50

Add wheels with Wheel Kit No. 909. Includes 6" wheels, handle, fittings. **$6.95**

FREE! Write for "How to Spray" Booklet and Literature.



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World's Lowest Priced Car!

Lower priced, improved performance. Drive it for 75c per week. Also KING MIDGET JUNIOR, finely engineered, less than one-third cost of any comparable car, one twelfth cost of large cars. Agents wanted. IT WILL PAY YOU TO GET THE FACTS. Send 25c for literature and agents proposition on both cars, or $1 (refunded first order) for this plus actual assembly book and service manual.

MIDGET MOTORS MFG. CO., ATHENS 2, OHIO

YOU MUST READ THIS!

Before you pay out another COSTLY PLUMBING BILL—

How many times have you seen the clogged up **SINK**, the **FLOODED BASEMENT**, or the damage done by the overflow of the **TOILET** or **URINAL**? Then—I'm sure you remember the Costly Plumbing Bill! Now, do it yourself with our New Rodding Tool which cleans out roots, grease rags up to 100 ft. Ideal for Home Owners, Apartments, and Factories.

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Parts and Accessories for all makes and models of cars from 1920 thru 1956!

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Please send 25¢ to help pay catalog mailing and handling costs. We will credit 25¢ on your first order for $5.00 or more. Mail coupon NOW!

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Mail This Coupon Today!

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Rush giant 1956 catalog of auto parts and accessories at sale prices. I enclose 25¢ to cover part of mailing and handling cost, which will be credited to me on my first $5.00-or-more order.

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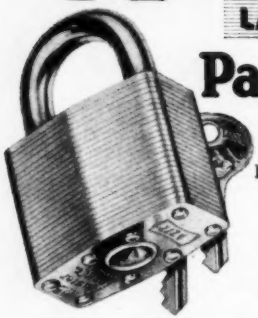
Padlocks



Layer on layer of solid steel for the powerful laminated protection that gives you peace of mind.

25¢ to $4.00, in a variety of sizes, at locksmiths and hardware stores everywhere.

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CABINETS

SHEDS

FREEZERS

FUEL TANKS

Master Padlocks

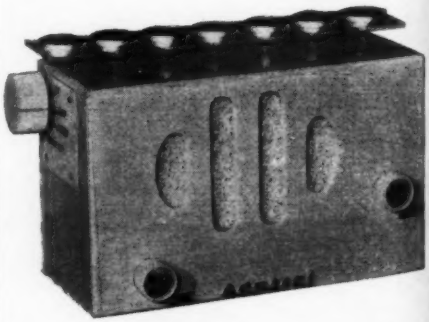
ALWAYS ON GUARD — DAY AND NIGHT

MASTER LOCK CO., Milwaukee 45, Wis.

World's Largest Padlock Manufacturers

How High Does a Fly Fly?

THAT's the question a team of English scientists is asking. To find out, the 10-foot fly trap above is launched by balloon at the Cardington airship station. Powerful electric fans suck in the flies—up to 7,500 a day. The answer will give weathermen valuable new data on air currents, and help devise better crop-spraying methods for farmers.



Sun or Lamplight Runs Radio Set

AN EXPERIMENTAL transistor radio powered by sunlight has been made by Admiral Corp., maker of radios and TVs. On dark days, the seven solar cells on the top can be activated by a heat lamp or 100-watt bulb, or the set can be switched to a sun-charged battery.

U.S. ARMY FIELD PHONE

A private phone or intercom system. Ideal for use on target range, farms, mountains, forest or any place where portable two-way communication is desired. This is the famous EE-8 field phone used to success by the Signal Corps. Gives clear reception up to 15 miles. Uses two standard batteries. Set consists of a ringing generator, one phone, all contained in the original handy carrying case. Several of these phones can be used on one line. Records checked out. Price per ea. phone. **14.95**

Price for a SYSTEM – two sets . . **29.50**

FROM IMPORTER
SAVE 50%

PHILIPPINE MAHOGANY PLYWOOD
AT PRICES LESS THAN WHOLESALE

For Paneling Dens, Offices, etc. Use in Cabinets, Furniture, etc. Rotary Cut. Both sides sanded. Bonded with finest resin adhesive. Face side unjointed. Shipped at lowest rates.

1/8" x 3 ft. x 6 ft. — $3.50 VAL. — MIN. ORDER 8 SHEETS — **1.79 SHEET**

FREE SAMPLE ON REQUEST

1/4" x 4 ft. x 8 ft. — $9.20 VAL. — MIN. ORDER 4 SHEETS — **4.49 SHEET**

AIR CORPS SEXTANT

Can be used for any navigational purpose. Contains many valuable optics, lenses, prisms, gears, drives, spring motor, bubble level, etc. Can be used as is. Comes with sturdy plastic bag. **17.95**

ARMY SURPLUS CAMP AXE

Top quality. Has a 23" hardwood handle. Extra sturdy steel head. Complete with leather belt holster with snap-down cover flap. **2.95**

SAVE 40% – TRANSLUCENT FIBERGLAS PANELS

Finest Quality. Ideal for Patios, Room Separators, Windbreaks, etc. In all lengths and widths. Many colors to choose from. Write for FREE SAMPLE and prices. An 85¢ per square foot value . . . . . **49¢ FT.**

QUALITY WOOD LEGS WITH BRASS TIPS BUILD OR RESTYLE YOUR FURNITURE

Beautifully turned, fully seasoned hardwood legs. Smoothly sanded and complete with brushed Brass tip and sturdy steel mounting plate. Available Finished or Unfinished – Finished units come in Blonde, Silver Fox, Mahogany or Charcoal Black. Please specify finish.

Price per set of 4 with Brass tip.

SIZE	FINISHED	UNFINISHED	SIZE	FINISHED	UNFINISHED
4"	$2.65	$2.15	14"	$4.40	$3.95
6"	3.00	2.65	16"	4.75	4.40
8"	3.55	3.00	18"	5.35	4.75
12"	3.95	3.55	28"	6.25	5.35

VICKERS HYDRAULIC TRANSMISSION

Self-contained, constant torque at all speeds with variable volume, reversible piston pump which supplies piston hydraulic motor. Has 2 H.P. Automatic pressure dash pot for smooth control. Power output RPM –0 to 1/3 input RPM in both directions. Input RPM 1800 continuous, 4000 intermittent. Ideal for Lathes, Duplicator setup on Mills, Conveyors, Small Cars, Drives, etc. **49.50**

4" SPLINE SHAFTS for input and power take-off on above. Pair **$2.50**

INPUT & TAKE-OFF PLATE ASSEM. To adapt Trans. to pulley drive. Has 1/2" keyway shaft. High Speed bearings. **20.00 SET**

3400 RPM-½ HP POWER SAW

RIPS - CROSSCUTS
CUTS A FINISHED 2x4 LIKE A KNIFE THROUGH BUTTER

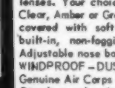
COMPARES TO SAWS SELLING UP TO $49.50 — **19.98** Complete with 5-1/2" Blade

A rugged, professional type, adjustable saw. Will cut any angle from 0 to 45°. Has an adjustable (0 to 6") rip fence. Safety-trigger switch on handle. Full ½ HP Universal AC-DC, 110-120 Volt, 60 cycle motor. Weighs only 6½ lbs. Thousands already sold. Your satisfaction guaranteed.

GENUINE AN6530 ARMY AVIATORS

GOGGLES

Has precision ground, interchangeable lenses. Your choice of 3 lens colors – Clear, Amber or Green. Frames are rubber covered with soft chamois lining and built-in, non-fogging lens ventilators. Adjustable nose bar and elastic headband. WINDPROOF – DUSTPROOF! Genuine Air Corps Surplus. NEW **2.49** Give lens color choice . . . . . EXTRA LENSES – colors above. **1.00 PR.**



SPECIAL VARIABLE SPEED DRIVE

Originally part of the turret gun sighting mechanism. A very valuable piece of precision machinery. Contains a gear reduction box, several bronze gears, a worm drive, many ball bearings, etc. This unit provides precise controlled output power which may be reversed while in operation. Forward and reverse output rpm may be controlled to closest tolerances. Can be adapted to many uses in machine work where exact, constant or variable output power is required. Sturdy bronze and magnesium castings, finest steel parts. **29.95**

SAVE UP TO 50% ON SPORT DIVING EQUIPMENT

BUILD YOUR OWN DIVING LUNG – SAVE

up to $100. Our special folder contains complete instructions showing how it's done. Kit includes Air Bottles, Pressure Regulator, Hoses, Safety Belt, Shoulder Harness, Clamps, Mouth Piece, Valves, etc. . . . . Price for above kit . . . With 2 Bottles (1 hour time) **45.95** $150.00 value

FREE CATALOG

Has latest info. on Diving Equipment. Plus an illustrated and described article on "How to build your own Diving Lung".

ARMY D-12 MAGNETIC COMPASS

Designed as navigational equipment on Army Aircraft. Has a rotating verge range ring, calibrated in 1 degree increments from 0 to 360°. Two parallel grid wires for N-S alignment. For use in Airplanes, Boats, etc. New, low price. . . . **9.95**

NEW SURPLUS ELECTRIC LINEAR ACTUATOR

Has a 5-1/4" stroke. Delivers an 800 pound thrust and will stand a 1750 lb. static load. Motor operates on 24 volt DC current at 11-1/2 amps – turns at 7500 RPM with 1/6 HP. The overall length, eye-to-eye is 13 inches **9.95**

SELSYN TRANSMITTER MOTOR

ONLY **14.95**

A Synchronous AC motor. The most accurate type of electric motor made. Will operate without speed variation for indefinite time. Ideal for precision work. 115 volt – 60 cycle. SUPPLY LIMITED

NEW

4-WAY OPEN CENTER CONTROL VALVE $21.50

Has built-in adjustable relief valve set at 1000 PSI. Spring loaded neutral position. For use with one double action cylinder. May be mounted in series. Has 3/4" pipe inlet and outlet with 1/2" pipe thread cylinder ports. Shipping weight 10½ lbs.

NEW OUTDOOR BUBBLER

NEW PERFECT FOR HOME GARDNER

5.95 VALUE

ONLY **3.95**

CONVERT ANY OUTDOOR FAUCET TO A DRINKING FOUNTAIN

Now you can have a convenient drinking fountain in your yard or patio! Attaches directly to your regular faucet and you enjoy a cool, refreshing drink by pressing a button. DOES NOT INTERFERE with the use of your garden hose. Made of polished nickel-plated bronze and brass with a durable Styrene Plastic Bowl.

FOR CHILDREN & ADULTS

NEW

133 PIECE POWER TOOL ACCESSORY SET

The complete accessory set for any small job. Can be used with any electric drill or grinder. Contains 133 pieces including grind, polish, cut-off & buffing wheels, sanding discs, steel cutters, mandrels, burnisher, mounted stones and knife edge rubber wheels. A very handy set for the model builder or hobbyist. Worth many times our price. **1.98**

SURPLUS BARGAIN

No. 29 HYDRAULIC CYLINDER – will give 20,000 pounds thrust using 1500 PSI line pressure as delivered from one of our hydraulic pumps. Gives up to 40,000 lbs. thrust with 3,000 PSI. Has a 4" bore and 18" stroke. Overall length 30½ inches.

USED **29.95** NEW **43.95**

SAVE 50% ON NEW PALLEY HYDRAULIC CYLINDERS

Send for Special HYDRAULIC CATALOG SUPPLEMENT – Shows entire line of new Hydraulic Equipment designed especially to fill the needs of Industry. Also SAVE up to 85% on War Surplus Hydraulic Equip. including Pumps, Valves, Fittings, etc.

ARMY CANTEEN CUP & BELT

IDEAL FOR BOY SCOUTS

Genuine U.S. Army equipment. The one quart canteen and aluminum cup fit into the insulated canvas cover. Cover hooks onto the web type pistol belt, which has metal grommets for hooking on other gear. **2.59**

ARMY SURPLUS WADING SUIT

Covers the entire body from the neck down. Protects you from mud, water, etc. Originally designed for overboard work in the Navy. Made of heavy duty rubberized canvas with vulcanized seams. Has built-in rubber boots and gloves. Sizes: Small, Med., and large. $35.00 value **8.95**

PRESSURE TANKS

G1 Type Stainless Steel. Shatterproof and rustless. Has reinforcing ribs and is pressure tested up to 400 PSI. Has high safety factor. 1/4" pipe ports. Ideal for use in air supply in underwater fishing, painting, spraying, etc. Also as buoy or for water supply. Size: 12½" x 24". Stainless Steel. . . **12.95**

Corrosion Resistant Steel TANK – No. D-2, 200 cu. in. capacity. . . . **3.95**

BOLO KNIFE

Top quality steel. 15" long. Complete with sturdy belt sheath. Use for clearing brush, etc. **1.98**

ARMY PICMATTOCK

Small, easy to use. Has a 12" steel head with Mattock on one side, pick on other. 16½" hardwood handle. With case. ONLY **1.98**

Palley's 2263 EAST VERNON AVE. DEPT. PS-3 LOS ANGELES 58, CALIF.

Order From This Ad. Pay by M.O. or check to deposit with C.O.D.'s

All Prices FOB Los Angeles

[Continued from page 267]

nomical rate of 1,000,000,000 tons every year. This new plant, and others like it, will make it possible to obtain the same tremendous amount of power from only one-third the coal."

Over the last 35 years, constantly increasing pressures and temperatures, and other technical improvements, have saved about 3,000,000,000 tons of coal over what would have been burned without this progress. Meanwhile, the average cost of electricity to the consumer has been going steadily down. When the Lakeside plant opened in 1920, the average domestic user throughout the U.S. paid 7.45 cents a kilowatt-hour; since then the price has gradually dropped to an estimated 2.65 cents for 1955—a decrease of 65 percent.

Savings: $128 a year. More and more electric home devices—refrigerators, freezers, water heaters, ranges, mixers, washers, dryers, room coolers, space heaters, radio and TV sets—have been adopted, until today the average family uses about eight times as much electric power as in 1920.

If this power were still sold at 1920 rates, the average homeowner's bill for electricity would be about $128 a year higher than it is today.

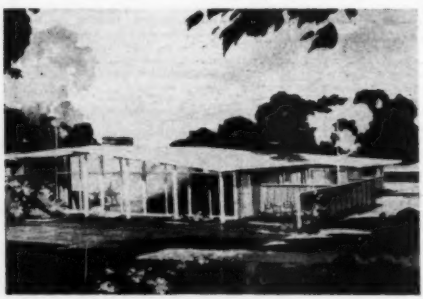
By no means has all this saving been brought about by fuel economy. Increased sales of any mass-produced commodity tend to lower production costs, and other important savings have been brought about by larger plants, labor-saving automatic controls, more efficient distribution and improved methods of handling customer accounts. But in the face of rising coal costs, the new economical plants are reducing fuel to a smaller and smaller item in the total cost of producing electric power.

A mark to shoot at. And the engineers have not yet reached the ceiling in their long drive to squeeze more power out of coal. It is theoretically possible, if metals can be found that will stand the gaff, to boost steam pressures and temperatures to a point where less than half a pound of coal will make a kilowatt-hour—one-sixth of the amount needed by the average plant in 1920.

Today this is regarded as highly speculative, but engineers have no intention of missing a bet.

Some time much of our power may come from nuclear fission, hydrogen fusion, solar energy or some new chemical process. Large sums are being spent exploring these possibilities. But the tremendous demands of the power-hungry boom give the utility industry no time to wait for such developments. Every 10 years they must install as much new capacity as has been installed in all past history. So every year they are spurring the "new power" pioneers by giving them a still tougher mark to shoot at. END

NEXT MONTH... PSM 1956 Home Show



EVEN if your house is only five years old, it is likely to be obsolete today. New designs, new materials, new machinery make the '56 model a new kind of home. POPULAR SCIENCE MONTHLY for April will bring you a special report on new ideas in housing—a sparkling new building plan, an eye-opening glimpse into the future, and page after page devoted to ways in which you can modernize the house that you are living in now.